Summer 2014

Effectiveness of field days on promoting the adoption of recommended improved maize varieties by small holder farmers in Lilongwe District, Malawi

Yakosa Charity Zgawa Tegha
Purdue University

Graduate School ETD Form 9
(Revised 01/14)

PURDUE UNIVERSITY
GRADUATE SCHOOL
Thesis/Dissertation Acceptance

This is to certify that the thesis/dissertation prepared

By YAKOSA CHARITY ZGAWA TEGHA

Entitled EFFECTIVENESS OF FIELD DAYS ON PROMOTING ADOPTION OF RECOMMENDED IMPROVED MAIZE VARIETIES BY SMALLHOLDER FARMERS IN LILONGWE DISTRICT, MALAWI

For the degree of Master of Science

Is approved by the final examining committee:

Dr. Jerry L. Peters

Dr. B. Allen Talbert

Dr. Roger Tormoehlen

To the best of my knowledge and as understood by the student in the *Thesis/Dissertation Agreement. Publication Delay, and Certification/Disclaimer (Graduate School Form 32)*, this thesis/dissertation adheres to the provisions of Purdue University's "Policy on Integrity in Research" and the use of copyrighted material.

Dr. Jerry L. Peters

Approved by Major Professor(s): _____

_____

Approved by: Roger Tormoehlen 06/27/2014

Head of the Department Graduate Program Date

EFFECTIVENESS OF FIELD DAYS ON PROMOTING THE ADOPTION OF RECOMMENDED IMPROVED MAIZE VARIETIES BY SMALL HOLDER FARMERS IN LILONGWE DISTRICT, MALAWI

A Thesis

Submitted to the Faculty

of

Purdue University

by

Yakosa Charity Zgawa Tegha

In Partial Fulfillment of the

Requirements for the Degree

of

Master of Science

August 2014

Purdue University

West Lafayette, Indiana

This work is dedicated to my darling husband, Phillip Tegha, and my dear children, Charity and Israel Tegha. It is a privilege to be your wife, Phillip, and to be your mother, Charity and Israel. Thank you for being there for me throughout my studies and praying for me every day. My achievement is a product of your prayers. Phillip, thank you for encouraging me that something good would come out, no matter what the situation was. Thank you all for supporting me and accepting that I could be away from you for a year and you kept on being peaceful and joyful. You are wonderful people. Thank you, Phillip, for your love and support for letting me proceed with my studies and for being available for our children. You are a special husband. Thank you, my dear and charming children, Charity and Israel, for being understanding and accepting that I go ahead with my school away from you for a year and for keeping on being charming to me every time I talked to you. God was taking good care of you, my children, more than I could if I was around, and he will always take care of you. My dear children, you have a bright future. God has excellent plans for you, "plans to prosper you and not to harm you, plans to give you hope and a future" (Jeremiah 29:11). Be committed, do everything with all your heart, mind, and strength not as unto man but as unto God and you will attain the goal God has set for you in this life. God is always there for you. Thank you, Phillip, Charity and Israel, you are great people. God bless you.

ACKNOWLEDGEMENTS

I would like to express my heartfelt gratitude to a number of people that made a wonderful contribution to the success of my study. The people mentioned here with many unmentioned, contributed to make my experience in conducting the study worthwhile. First and foremost appreciation is due to Dr. Jerry Peters my advisor and chair of my research committee. Thank you for your advice, guidance and patience. You were always available to support me throughout my study. You were a teacher as well as a Father to me. Thank you very much for everything that you did to help me along my journey.

My appreciation also goes to members of my research committee Dr. Brian A. Talbert and Dr. Roger Tormoehlen for their availability and insightful ideas into the proposal and the thesis, without who this study would not have been successful.

Many thanks to my parents Mr. and Mrs. Zgawa Luhanga, I am where I am today because of your love, sacrifice, care and advice. Your belief in me that I have the ability to make it in life instilled a spirit of confidence that I am capable of succeeding in everything that life brings before me. God bless you for raising me up. I still remember your soft voice extending best wishes to me during my exams, that was encouraging to me.

Many thanks to Michigan State University/UILTCB, for the financial support. I always had a heart of continuing with my education since ten years ago but I never had an opportunity to be funded. I am grateful that you came along at the right time to fulfill my long standing desire, without you my desire could have been just a dream.

Many thanks to the Youth Development and Agricultural Education Department, at Purdue University for the contribution to this research.

I am indebted to the Ministry of Agriculture and Food Security in Malawi through the Department of Agricultural Extension Services (D.A.E.S) for the technical support to this study. I would like to thank madam Chowa the Deputy Director for DAES for her advice and support from the beginning of proposal writing all though finalizing the study.

My gratitude to Assemblies of God church members from Falls Church in Malawi and from Connection point in America for their physical and spiritual support during my trying times. I made it because you stood with me.

I would like to express my sincere thanks to extension workers and farmers from Chitsime and Mpingu Extension Planning Areas in Lilongwe District for the support throughout my study.

Professor Judith Nixon, thank you very much for your untiring support. Finally I would like to thank God for his faithfulness to me, never once did he ever leave me alone.

Personal Reflections

Frankly speaking, I had a good experience in the data collection and writing this research paper. As an extension worker staying in Lilongwe District, these are my people. I know the culture of the farmers that I was conducting my research with. It could not have been easy for someone from outside to collect detailed data from the area. Farmers would not have opened up to provide information as they did with me. Knowing that these people were illiterate they felt more comfortable sharing information with someone from their local area than they could with an outsider.

I thank God for my Professor's guidance in the writing process, the advice received from him brought an "ah-ha" moment in my life as I was writing.

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

Table Page

ABSTRACT

Tegha, Yakosa C. Z., M.S., Purdue University, August 2014. Effectiveness of field days on promoting the adoption of recommended improved maize varieties by small holder farmers in Lilongwe District, Malawi. Major Professor: Jerry L. Peters.

The study described the contribution of field days to promoting the adoption of improved maize varieties by small holder farmers of Chitsime and Mpingu Extension Planning Areas (EPAs) in Lilongwe District, Malawi. Sixty farmers from two EPAs where the field days had been conducted were randomly selected. Data were collected through personal interviews because literacy was a problem among farmers. The results of the study showed that 31 (51.7%) of the farmers interviewed were female. Use of other methods such as radio, mobile van, leaflets, posters, village meetings and messages sent to farmers' cellphones helped to popularize the improved maize varieties. The top three advantages of planting improved maize varieties were reported to be: high yielding, resistant to disease and pest, and good taste. The top three disadvantages of planting improved maize varieties were reported to be: low storability, rot while in the field, and high implementation cost.

The field days conducted were found to contribute to promoting the adoption of improved maize varieties. Farmers were able to learn new information about the

improved maize varieties and all farmers expressed interest in planting the improved maize varieties demonstrated during the field days. Fifty-three (88.3%) farmers rated field days as an appropriate method for disseminating information about improved maize varieties. It was reported that adequate time needs to be allocated for farmers to view demonstration plots and that invited guests should arrive on time and not dominate speaking during the field days. Conducting the field days at a central location near the farmer's village would allow more farmers to participate in all stages of maize production. The use of flat iron sheets in place of flipcharts to explain what is being demonstrated at the farm plot would prevent the information from becoming damaged during inclement weather. It was also suggested that farmers need to be separated into male and female groups during viewing of the demonstration plots to allow for the asking of questions by both genders. Finally there is also a need to increase extension staff and farmer interaction through follow up after each field day.

A Pearson's Spearman Rank Coefficient (rho) indicated that among the variables: age, size of household, number of years farming and size of farm in acres there was a very strong positive relationship between size of the farm in acres and area used to grow maize last season ($r = .716$). A Point Biserial Coefficient (r_{pb}) indicated there was negligible relationships between the variables: gender, marital status, level of education and the number of acres used to grow maize last season.

CHAPTER ONE: INTRODUCTION

Malawi's economy is dependent on agriculture. It contributes 30% to the GDP, employs 80% of the 14 million people in the country, and contributes 75% of the export earnings. There are two sectors in agriculture; small holder (small scale farmers cultivating under customary law) and estate sub sector (large-scale farmers on leasehold land). The small holder farmers comprise over 80% of the farmers in Malawi. It should be noted that performance of the small holder farmers has a direct impact on the performance of the country's economy (GoM, 2011).

Maize, a staple food for Malawi, is grown by the majority of small holder farmers. The Malawian people need maize to produce *nsima* (stiff porridge made from the refined maize flour). Maize is also a source of livelihood in Malawi. Maize is life (Smale, 1995). The local definition of food security in Malawi is production of adequate maize (Chirwa, Kydd, & Dorward, 2006). Chirwa et al. reported that 62.9% of female headed households and 54.6% of male headed households were not having enough food to consume. Zeller, Diagne, and Mataya (1998) reported that 70% of the area planted to crops accounts for maize, but the study also showed that among other factors, decrease in hybrid maize planting contributed to small holder farmers maize self-insufficiency. Being an agrarian economy, the use of improved high yielding maize varieties are of national importance to Malawi. Smale (1995) reported that production of improved maize

varieties in Malawi would help small holder farmers increase production which would enable farmers to re-allocate part of the land to other crops that are of nutritional importance. Development strategies in Malawi have put emphasis on raising yields of maize to ensure food self-sufficiency for rural households (Chirwa et al.). The improved maize varieties released by research are aimed at increasing productivity so as to improve maize self-sufficiency by farmers. However small holder farmer's adoption of improved maize varieties has been very slow (Chinsinga, 2011).

Agricultural Extension Services in Malawi are coordinated by the Department of Agricultural Extension Services (DAES), (Phiri, Chilonda, & Manyamba, 2012). The Department has a mandate to provide quality agricultural extension services in order to enhance adoption of improved technologies for farmers. Agriculture Extension's role in Malawi is providing technical information from a research based source (research institutions, private entrepreneurs) to farmers with the aim of enabling the farmers to acquire knowledge and skills for a specific enterprise (Department of Agricultural Extension Services 1997). Extension is a non-formal means of adult education for the rural population in farming related subjects. This is done with a set purpose of enabling farmers to use skills, knowledge and information to improve crop or animal production with an ultimate goal of improving their quality of life. In Malawi the agriculture extension personnel to farmer ratio is very high, and currently is at 1:2,500 while the recommended extension to farmer ratio is 1:750 (Chowa, 2010). This therefore necessitates the use of teaching methods that will reduce the gap of inadequate extension workers in order to increase interaction with farmers in providing extension services to

them. The extension methods that are used for information and knowledge sharing in Malawi are: demonstrations, field days, study tours and training (Phiri et al., 2012). According to Chowa (2010), the extension methods that are functional in promoting some technologies are; demonstrations, field days, radio, simple publications and mobile vans. The Malawi government is currently intensifying use of field days in disseminating information on improved maize varieties to small holder farmers. Gaikwad, Godase, and Tambe (2011) reported that farmers adopt a technology after observing the results.

The challenge faced by agriculture extension workers has always been the movement of technology from the laboratory to the field (Barao, 1992). Field day is an extension teaching method used by extension workers to explain improved agricultural technologies to farmers (Ajayi, 2001). Field day is one of the group extension teaching methods used in Malawian Extension Services. It is an event organized for a group of farmers to see improved technologies being practiced on one or more farm's demonstration plots (Department of Agricultural Extension Services 1997). These technologies can be those newly released or already existing. Field days are usually organized for small groups. It is expected to have plenty of time for discussion, questions and inspection of the farm where the field day is being held. All farmers in the area where the field day is conducted are invited to attend the field day. The aim of the field day is to stimulate farmers' interest in adoption of innovations and to convince them of the point and practicability of the technologies being demonstrated (Department of Agricultural Extension Services 1997). Field days are important because they provide a forum for interaction between farmers and extension staff and among farmers themselves for

sharing new information and experiences (Osward, 2005). Field days provide the right platforms for farmers to share information within specific environments (Amudavi, Khan, Wanyama, Midega, Pittchar, Hassanali, & Pickett, 2009). The objective of the field day, as stated by Gibbons and Schroeder (1983) is: "to bring farmers together on a site to enable them to gain knowledge and skills in a relaxed environment, create awareness of improved technologies and show the results of the technologies, and stimulate adoption of improved technologies by farmers so as to improve yield" (p. 171).

Statement of the Problem

Although Malawi is an agro-based country and maize is a staple food crop, farmers adoption of improved maize seed has been slow (Smale, 1995) and Chinsinga (2011). Literature has shown that the challenge faced by agriculture extension workers has always been the movement of technology from the laboratory to the field (Barao, 1992). If farmers are to adopt a technology, one of the qualities that determines success of a technology is observable results (Gaikwad et al., 2011). This will require farmers to see the results of a technology through field days conducted on demonstration plots and farmers' fields (Adolwa et al., 2012).

Field day is one of the group extension teaching methods used in Malawian Extension Services in order to stimulate adoption of improved maize varieties by farmers. However research is not conclusive in regards to the effectiveness of the field days from the small holder farmers' point of view. Information from the small holder farmers is needed for improved performance of the field days for better services.

Purpose of the Study

The main purpose of this research study was to describe the contribution of field days to promoting the adoption of improved maize varieties by small holder farmers of Chitsime and Mpingu Extension Planning Areas (EPA) in Lilongwe District, Malawi.

The research for this study was quantitative in nature. Two field days were studied in each EPA where improved maize varieties had been grown on demonstration plots.

Research Objectives

This research assessed the extent to which field days contribute to promoting the adoption of improved maize varieties by small holder farmers in Malawi. Roth, Brooks-Gunn, Murray, and Foster (1998) indicated that the key to a successful program is evaluation because decision makers are provided with important feedback that helps in program implementation. Because of the strength of the evaluation explained, the researcher conducted a study of the field days by enabling farmers to assess the effectiveness and organization of the field days in influencing farmer's knowledge and stimulating adoption of improved maize varieties.

The specific research objectives for this study were to determine:

1. The level of knowledge of the improved maize varieties acquired by farmers attending field days.

2. The level of knowledge by host farmer and extension workers on the improved maize varieties.

3. The logistical organization of the field days.

4. Farmers' assessment of their ability to plant improved maize varieties demonstrated during the field days.

5. The relationship between age, size of household, number of years farming, size of farm (in acres), gender, marital status, level of education, and number of acres used to grow maize last season.

Definitions

Adoption: "The decision to make full use of an innovation as the best course of action available" (Rogers, 2003, p. 473).

DAES: Department of Agricultural Extension Services.

Decision: "That which occurs when an individual engages in activities that lead to a choice to adopt or reject an innovation" (Rogers, 2003, p. 474).

Diffusion: "The process by which an innovation is communicated through certain channels over time among members of a social system" (Rogers, 2003, p. 474).

Effective: Ability to achieve the objectives of the field day (as defined in this study).

Extension Method: "Techniques of communication between extension workers and farmers (and also among farmers themselves) with the aim of motivating and enabling farmers to identify ways of solving their problems" (DAES, 1997, p. 1).

GoM: Government of Malawi.

Innovation: “An idea, practice or object that is perceived as new by an individual” (Rogers, 2003, p. 475).

Knowledge: “That which occurs when an individual learns of the innovation’s existence and gains some understanding of how it functions” (Rogers, 2003, p. 475).

Logistics of the field day: Set up of demonstration plots, time allocation to activities, interactive learning of farmers (as defined in this study).

Social system: “A set of interrelated units involved in joint problem solving to accomplish a common goal” (Rogers, 2003, p. 476).

Assumptions

The key assumptions for the study were:

1. Farmers being interviewed attended the field days.
2. Farmers understood the questions read to them by the researcher.
3. The researcher was objective in conducting the study to minimize bias.
4. The questionnaire developed captured the required data.
5. Farmers were honest in their responses.
6. The research used a positivism paradigm.

Limitations

Limitations of this study included:

1. The researcher could not control how farmers may have received information about new maize varieties other than field days.

2. The researcher could not control what happened between the time of the last field day and when the data was gathered for this study.
3. Self-selection of the farmers that attended the field day. It was a limitation because it did not include farmers that might have adopted the improved maize varieties using extension methods other than attending field days.
4. The researcher's familiarity with field days.
5. The questionnaire approach limited responses as compared to open ended questions.
6. The research was focused on field days conducted by extension workers; this limited the applicability of the results to field days conducted by agro dealers.
7. The subject characteristics threat (selection bias): the selection of farmers might have resulted in individuals differing from one another and from the broader population of all farmers.
8. Location threat: the venue for the field day might have created alternative explanations for the results.
9. Attitude of subjects: the way subjects viewed the researcher as a government official.
10. The sample was taken specifically from Lilongwe District hence the results could not be generalized to other districts in Malawi.

Significance of the Study

Considering that Malawi's economy is dependent on agriculture (GoM, 2011) and that small holder farmers comprise over 80% of farmers (GoM, 2000) the performance of small holder farmers has a direct impact on the country's economy (Chowa, 2010). One observation model indicated that if farmers are to adopt a technology they require to see the performance of the technology through field days on farmers' fields (Adolwa et al., 2012). Field days provide a forum for interaction between farmers and extension staff and among farmers themselves for sharing new information and experiences (Ajayi, 2001; Amudavi et al., 2009; Badu-Apraku et al., 2001; Nyabundi & Kiprono, 2011; Osward, 2005). Limited studies have been conducted on field days but not with small holder farmers in Malawi. Of the two studies conducted in Malawi, one study presented the extension workers view of the field days and did not have empirical evidence while another study focused on the farmers preference on media communication channels; print and radio (Chowa, 2010; Kanchewa, 2012). It is important to study the effectiveness of field days as one of the group extension teaching methods to increase interaction with farmer's since the extension personnel to farmer ratio is very high, 1:2,500 (Chowa, 2010). This research will provide feedback from farmers, which will inform extension agents on how to better organize and conduct field days.

CHAPTER TWO: REVIEW OF THE LITERATURE

This chapter provides a review of related literature on field days as an extension teaching method. The search was done through a Purdue University Library search using ERIC and CAB Direct. Additional searches were conducted through Google scholar where most of the articles from the *Journal of Agricultural Education and Extension*, *Journal of International Agricultural and Extension Education*, *Journal of Extension*, *Indian Journal of Sericulture*, *International Journal of Agricultural Sciences*, *Journal of Sustainable Agriculture*, *Journal of Developments in Sustainable Agriculture* and *Journal of Crop Protection were found*. The following key phrases were used; extension teaching method, field day, adoption, innovation, diffusion, dissemination, effective, demonstration, maize, communication, and impact of field day. Of the articles found, only one study (Chowa, 2010) reported on the field days as one of the reliable extension methods in disseminating improved technologies in Malawi. The report was written from secondary data sources; basically they were staff perceptions of the field days. None of the literature searched reported the farmers' perception towards the effectiveness of field days that are conducted in Malawi.

Field day is a popular extension teaching method used in Malawian Extension Services and other countries. Many farmers attend the field days, hence this provides a platform to resolve several agricultural issues (Nyabundi & Kiprono, 2011).

The review for this study was divided into five sections: theoretical framework, knowledge of the introduced technology, sharing of information among farmers, logistical organization of field day and decision to adopt technologies.

Theoretical Framework

The theoretical framework of this study came from Everett Rogers' Theory of Diffusion of Innovations which explains how new ideas and technologies are spread and adopted in a community (Rogers, 2003). Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among numbers of social systems" (p. 11). The four elements of the Diffusion of Innovations model are the innovation, communication channels, time and social system.

The innovation: Rogers (2003) defined an *innovation* as "an idea that is perceived as new by an individual. Newness of an innovation not only involves new knowledge, it includes people who have known about an innovation but not yet developed a favorable or unfavorable attitude towards it, nor adopted or rejected it. Newness may be expressed in terms of knowledge, persuasion or decision to adopt" (p. 12). In the field day being studied, farmers saw improved maize variety as an innovation. The characteristics which determine an innovation's rate of adoption are:

1. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes. The greater the perceived relative advantage the more rapid its rate of adoption will be.

2. Compatibility is the degree an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters. An idea which is not compatible with the social norms and values will not be adopted rapidly.
3. Complexity is the degree to which an innovation is perceived as difficult to understand and use. Complicated innovations are adopted slowly.
4. Trialability is the degree to which the innovation may be experimented with on a limited basis. An innovation that is trialable represents less uncertainty to the intended adopter as it is possible to learn by doing.
5. Observability is the degree to which the results of an innovation are visible to others. The easier it is for individuals to see the results of an innovation, the more likely they are to adopt (Rogers, 2003, p. 15 – 16). Field days provide a forum for farmers to observe the results of a technology (Adolwa et al., 2012).

According to Rogers (2003), "Innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, observability and less complexity will be adopted more than other innovations" (p. 16).

Communication channel: Rogers (2003) defined *Communication channel* as, "the means by which messages get from one individual to another. Mass media channels are more effective in creating knowledge of innovations whereas interpersonal channels are more effective in forming and changing attitudes toward a new idea" (p. 18). Interpersonal channels involve a face- to -face exchange between individuals. Interpersonal channels that link individuals of similar socio economic status are reported to be more effective in persuading an individual to accept a new idea, (Rogers, 2003, p.

18). Field days provide a forum for interaction between farmers and extension staff and among farmers themselves for sharing information (Ajayi, 2001; Amudavi et al., 2009; Badu-Apraku et al., 2001; Nyabundi & Kiprono, 2011; Osward, 2005). This study was looking at the farmers if they thought the extension workers and host farmers were knowledgeable of the improved maize varieties that were being explained. Rogers (2003) indicated that there is a positive relationship between knowledge of the instructor and the adoption of a practice.

Time: The *time* dimension is involved in diffusion in three ways; the innovation-decision process, the innovativeness of an individual, an innovation's rate of adoption. The *innovation-decision process* is "the process by which an individual passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject" (Rogers, 2003, p. 20). Rogers conceptualizes five main steps in the innovation-decision process: (1) Knowledge, (2) Persuasion, (3) Decision (4) Implementation (5) Confirmation

1) "Knowledge occurs when an individual has to be exposed to an innovations existence and gain understanding of how it functions.
2) Persuasion occurs when an individual forms a favorable or unfavorable attitude toward the innovation.
3) Decision takes place when an individual gets engaged in an activity that leads to choice to adopt or reject the innovation.
4) Implementation occurs when an individual puts a new idea into use.

5) Confirmation takes place when an individual seeks reinforcement of an innovation-decision already made, but he or she may reverse this previous decision if exposed to conflicting messages about the innovation" Rogers (p. 169).

Field days help farmers see the performance of improved maize varieties in the field. By studying the effectiveness of the field day, the researcher was assessing if the field days had addressed the set objectives as well as farmers' needs. Field days are meant to help farmers go through this process hence there was need to study their effectiveness.

The *innovativeness of an individual: "*Innovativeness is the relative earliness/lateness with which an innovation is adopted compared with other members of a system." (Rogers, 2003, p. 22). Rogers categorized adopters into "five groups on the basis of their innovativeness: Innovators – 2.5%, Early adopters – 13.5%, Early majority – 34%, Late Majority – 34%, Laggards – 16 %," (p. 37). *Innovators:* Rogers (2003) defined this group of individuals as venturesome; these are the first group of people to adopt an innovation. Rogers mentioned that "venturesomeness is almost an obsession with innovators" (p. 282). *Early adopters:* Rogers (2003) explained that this group looks towards innovators in order to form an opinion about an innovation. This group is said to have a certain level of respect. This group forms an opinion of an innovation and then, "put their stamp of approval on a new idea by adopting it" (p. 283). *Early majority:* this group adopts an innovation just before the general group. Early majority, "deliberate for some time before completely adopting a new idea" (Rogers, 2003, p. 284). *Late majority:* this group of adopters' most important characteristic is skepticism, they wait until other adopters have used the new technology before they follow. Rogers (2003) explained that, "the pressure

of the peers is necessary to motivate adoption" (p. 284). *Laggards:* this is the last group to adopt an innovation. Laggards, "tend to be suspicious of innovation and of change agents" (Rogers, 2003, p. 284). Rogers (2003) defined the rate of adoption as a, "relative speed with which an innovation is adopted by members in the social system " (p. 37). Most groups of people are reported to be in the early majority and late majority hence the need for an effective extension methodology that will motivate the farmers to adopt an innovation. *"*An *innovation's rate of adoption* in a system is usually measured as the number of the members of the system who adopt the innovation in a given time period. The innovation's rate of adoption is influenced by the previously explained five perceived attributes of an innovation" (Rogers, 2003, p. 20).

Social system: A social system is defined as, "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members of the social system may be individuals, informal groups, organizations" (Rogers, 2003, p. 23). In this study the members consist of small holder farmers, host farmers, extension staff and stakeholders in agriculture. Rogers explains that the social structure of the system affects diffusion's innovation and can facilitate or impede the diffusion of innovation. Structure is defined as the patterned arrangements of the units in a system. Interpersonal networks linking a system's members consist of an informal structure, this traces who interacts with whom under which circumstance. This is referred to as communication structure; "the differentiated elements that can be recognized in the patterned communication flow system" (Rogers, 2003, p. 24). According to Ajayi (2001), the innovation model explains that farmer's response towards an innovation is influenced by

the innovation as well as the method of information dissemination. The field day's objective is to bring farmers together so that they interact and share experiences (Gibbons & Schroeder, 1983).

Many studies regarding agriculture extension have used the Theory of Diffusion of Innovations to guide the research. Hubbard and Sandmann (2007) explained that the diffusion of innovation framework helps extension program planners, evaluators to "gain better understanding of the reasons an educational program results in adoption or rejection of a particular practice" (p. 1). Marsh, Pannell and Lindner (2000) used the theory in their study, "The Impact of Agricultural Extension on Adoption and Diffusion of Lupines as a New Crop in Western Australia." The findings of their study indicated that the earlier start of the adoption process was contributed by both the agricultural extension activities and the presence of private consultants.

Inaizumi (1999) used the Theory of Diffusion of Innovations, and found that the role of information and seed exchange was one of the critical issues in the diffusion of innovation. The study stated that most farmers received information from other farmers in the village.

Harrer, Weijo and Hattrup (1988) used the theory in their study about the role of extension agents in new products. They found "dissemination of information through communication channels capable of influencing product adoption is key to success" (p. 101).

The diffusion of innovation theory was used in this study because the literature indicated that the application of diffusion theory is useful for examining how elements of a teaching method can apply insights from the theory to the increased adoption of the practice (Yates, 2001). Rogers diffusion of innovation theory was used to guide the study because it helped to explain how the following independent variables; knowledge of the introduced technology, Extension worker and host farmer's effectiveness, logistics of organizing the field day, played a role in a farmers' decision-making process.

Knowledge of the Introduced Technology

Rogers (2003) described awareness – knowledge, as the information that an innovation exists. This type of knowledge may motivate individuals to seek the second type of knowledge; "how-to knowledge: information necessary to use an innovation properly" (p. 173). Rogers (2003) further explained that when an individual knows of the existence of an innovation, that individual develops a need. Change agents can create need among their clients by pointing out the existence of desirable new ideas, thus knowledge of the existence of an innovation can lead to adopting it. Rogers (2003) reported that "potential adopters of a new technology are aided in evaluating an innovation if they are able to observe it functioning under conditions similar to their own" (p. 389). He further reported that change agents may speed up the rate of adoption by organizing demonstrations of a technology which increases observability of the results. He also indicated that demonstrations serve two functions: experimental, where effectiveness of an innovation is evaluated under field conditions and another function being exemplary; this facilitates diffusion of innovations, it is intended to persuade

potential adopters. Rogers suggested that the demonstrations should be conducted with high public visibility.

Nyo (2009) studied the crop demonstration approach for technological diffusion, he focused on how significant the approach is to increase yield. Maize demonstration plots were established on farmers' fields. Sampling was done at the community, group and farmer level. The researcher developed a questionnaire for interviewing 200 sampled farm households during data collection. Nyo observed that from the estimation of the production function, demonstrations had a positive impact on production. The author pointed out that the impact of the demonstration on adoption of the improved varieties showed that there was a spillover effect from the farmers that had an experience with the demonstration to farmers that did not have an experience with a demonstration. The author observed that because of the capacity gap, farmers were unable to produce according to potential. He suggested that the gap could be filled if farmers were exposed to information on improved technologies. Hence the need to study field days on improved maize varieties.

Isife and Emah (2008) conducted a study on the impact of demonstrations of recommended farm practices among farmers. One hundred and thirty farmers were randomly selected and interviewed using a questionnaire. Data analysis involved frequency counts, percentages and mean scores. The authors found that, rate of awareness of technologies disseminated were low, for all media of information that was used. This study used similar analysis on the field days.

Another study by Nyabundi (2011) focused on the impact of field days on technology dissemination in tea. The study was aimed at obtaining feedback on the services offered during the field days. The author analyzed secondary data collected through questionnaires administered to 480 attendees of the field day in 27 Tea Development Authorities in Kenya between 2003 and 2008. The author found that field days were effective as a technology transfer strategy. The study emphasized that there is a need for adequate publicity in order to create awareness among farmers.

In 2000, Ajayi (2001), evaluated the effectiveness of field days as a technology transfer strategy in Nigeria. A random selection of 52 farmers was utilized. Data were collected through interviews in a field survey. The researcher found that awareness had a positive significant correlation with adoption of technologies. He noted that field days were effective on the introduced technology of cassava rapid multiplication, based on the levels of awareness and adoption of the technologies transferred. The results by Ajayi (2001) which indicated that field days increase awareness and adoption of technologies were similar to results of a study that was evaluating communication strategies that foster adoption by (Harrer et al., 1988). They found that interaction with experts was effective in both creating awareness and adoption of technologies. However, in Malawi research was not conclusive in regards to the effectiveness of field days being conducted in relation to adoption of improved maize varieties.

Effectiveness of Extension Workers and Host Farmer

The host farmer's role is to explain the details of the technology displayed on the demonstration plot. This study will assess the extent to which farmers felt the field day

facilitators (extension workers, host farmers) were knowledgeable of improved maize varieties. The facilitators' knowledge influences information acquired by farmers (Amudavi et al., 2009). A study by Aphunu and Otoikhian (2008), on farmers perception of effectiveness of extension educators, indicated that respondents were not impressed with extension agents in regards to teaching and communication skills. There was a significant association between the effectiveness of extension agents and the adoption of technologies. Research by King and Rollins (1995) indicated that change agent's attitude and technical information influenced the adoption of an agricultural innovation by participants who received information from a training program. Rogers (2003) found that instructors must be credible if innovations are to be adopted.

Logistics of Organizing the Field Day

In order to have a significant impact on the demonstrations of recommended agricultural technologies among farmers, adequate logistics and appropriate campaigns should be used (Isife & Emah, 2008). This was concurred by Nyabundi and Kiprono (2011) who assessed the impact of field days on technology dissemination in 27 tea development authorities. Secondary data were collected for 480 attendees. Questionnaires were administered to field day attendees, the main questions asked were: if farmers found field days useful, if there was anything they learned from the field day and if there was anything they were planning to apply. The researcher analyzed data using the Microsoft Excel statistical software. He observed that for field days to be effective there is a need for good logistical organization in terms of planning and publicity. This research used a questionnaire for farmers that attended the field days.

Sharing of information among farmers: Interactive learning; in the book, Diffusion of Innovations by Rogers (1995), the author cited findings by Ryan and Gross (1943), that the interpersonal networks are very important in the diffusion process and that farmer to farmer sharing of experiences was core. Inaizumi (1999) in a study on the adoption and impact of dry season dual purpose cowpeas found that most farmers received information from other farmers in the village. This was in line with Nyo (2009) who noted that there was a spillover effect from farmers who attend the demonstration and start using it. However, none of these studies were from Malawi.

Decision and Adoption of Technologies

Studies on adoption are important because they give an insight on assessing the effectiveness of technology transfer. "Implementation of an innovation happens when an individual puts it into practice" (Rogers, 2003, p. 179). Gaikwad, Godase, and Tambe (2011) explained that knowledge gain is done through farmers visiting successful farms; they also stated that if farmers are to adopt a technology, one of the qualities that determine success of a technology is observable results. This was in line with Nyabundi and Kiprono (2011) where the researchers found that many farmers attended field days. This provided a good environment for addressing several issues.

In 2004, Masangano and Miles conducted a study on the factors influencing adoption of Kalima bean variety in Malawi. The researchers conducted interviews with 476 participants, from Lilongwe and Kasungu Agricultural Development Divisions (ADD). The researchers found that the majority of the respondents expressed an interest to plant the improved variety again in the other growing season. The authors also pointed

out that farmers knowledge and perception of the characteristics of the variety had influenced their willingness to adopt the variety (Masangano & Miles, 2004). The researchers concluded that in order to increase rates of adoption for improved technologies, there is a need to deliver information using extension methods that even farmers who cannot read can understand.

In a study of evaluating the factors influencing adoption of Push and Pull Technology (PPT), Khan, Amudavi, Midega, Wanyama, and Pickett (2008), conducted interviews on a random sample of 478 farmers that were practicing the technology and 445 farmers that were not practicing but just visited the field day. The researchers found that both groups of farmers noticed that the PPT was a better technology than the maize production practices they were using. The study recommended the need for effective methods for disseminating information to farmers. A follow-up study was done on evaluation of farmers' field days as a dissemination tool for push – pull technology, (Amudavi et al., 2009). Data were collected from 1,492 participants through a survey during the 45 field days. The researchers found that the majority of the respondents acquired new knowledge during the field day. They concluded that if extension workers have to disseminate new technologies, field days were the most appropriate. This research used some aspects of the field day that Amudavi et al. (2009) used to evaluate effectiveness of the field day. Krishnamoorthy and Radhakrishnan (2012) conducted a study on knowledge and adoption of new sericulture technologies among small mulberry farm size holders. A random sample of 104 farmers was used with 52 farmers from each Sericulture area. Data collection was conducted through interviews. Knowledge of a

technology was measured as 1 “full” complete knowledge and 2 “no” no knowledge of the technology. Adoption of a technology was measured as 1 “full” practicing the recommended technology and 2 “no” not practicing the technology. The researchers found that the major constraint to adoption of a technology by farmers was lack of awareness. The findings from the study also indicated a significant association between extension contact, participation and knowledge level of technologies of farmers. However, most farmers did not adopt the recommended technology. The researchers recommended that extension workers should conduct demonstrations in order to motivate farmers to adopt.

In a study on knowledge level and adoption of the integrated pest management (IPM) techniques, Chowdhury and Ray (2010) selected 150 vegetable growers. Data were collected using a questionnaire through personal interviews. The researchers found that 94% of the respondents had low knowledge of IPM practices among vegetable growers. There was also low adoption of the IPM practices. Contact with extension staff was positively correlated with knowledge and knowledge and adoption were also highly correlated. The researchers suggested that there is a need for efficient extension methods to let farmers know about the recent technologies and that extension workers should frequently use friendly extension methods that will inform farmers of the recent IPM techniques.

Typical Malawi Field Days

Most small holder farmers produce below the average potential yields in most crop enterprises because of low adoption of modern technologies. Field days therefore,

provide an opportunity for farmers to see the performance of improved technologies in increasing the productivity of crop enterprises (DAES, 1997). A field day is an event organized for a group of farmers to see improved technologies being practiced on one or more farm's demonstration plots. These technologies can be those newly released or already existing. Field days are usually organized for small groups. It is usual to have plenty of time for discussion. The aim of the field day is to stimulate farmers' interest in adoption of innovations (DAES, 1997).

According to DAES (1997), in planning for the field days a committee is put in place to prepare for the field day. The plans made by the extension workers are discussed with the host farmer as well as with the hosting committee (host farmer, area farmers and extension workers). The host farmer is to do most of the talking at a field day. The extension worker provides guidance so that the purpose of the field day is successfully accomplished. During the actual field day, the following activities are to be included:

1. Welcoming the farmers and the guest of honor for the function.
2. Briefing the farmers on the theme and objectives of the field day.
3. Letting farmers view the field day sites.

After the field visit, there is time for questions to capture those that were not asked during the field visit so that other groups should also benefit. Extension workers are to ask farmers of their experience; what they saw, what they learned.

CHAPTER THREE: METHODS

Purpose of the Study

Extension Education is also known as a form of non-formal education. In the book, *Education Through Cooperative Extension* by Seevers, Graham, and Conklin (2007), the authors cite the definition of non-formal education by (Coombs, 1973) as "any organized educational activity outside the existing formal system" (p. 130). They further cite the summaries of literature on non-formal education by Etling (1975) and Khan (1989) as six dimensions of non-formal programming. These six dimensions are: learner centered approach, variety of flexibility, mutual respect and trust, use of local resources, timeliness and usefulness and lower level of structure. By using these six dimensions of non-formal education, questions were developed to help guide the research in determining the farmer's perception towards the effectiveness of field days. The study looked at how the field days contribute to a learner centered approach: the learner (farmer) being actively engaged in the educational process; how field days demonstrate a variety of flexibility by providing learning opportunities that are based on the needs of the farmers; how field days contribute to mutual respect and trust by providing a learning environment that involves an interaction process between the extension personnel and farmers who attend the field days; and how creative problem solving is encouraged during field days by helping the farmers see the importance of using existing local resources. It is anticipated that the results from this research will help

extension staff in the planning and conducting of field days for the benefit of the small holder farmers in Malawi.

Statement of the Problem

The purpose of this study was to describe the contribution of field days in promoting adoption of recommended improved maize varieties as perceived by small holder farmers, the specific research objectives for this study were to determine:

1. The level of knowledge of the improved maize varieties acquired by farmers attending field days.
2. The level of knowledge by host farmer and extension workers on the improved maize varieties.
3. The logistical organization of the field days.
4. Farmers' assessment of their ability to plant improved maize varieties demonstrated during the field days.
5. The relationship between age, size of household, number of years farming, size of farm (in acres), gender, marital status, level of education and number of acres used to grow maize last season.

Malawi has eight Agriculture Development Divisions (ADD), one of which is Lilongwe ADD. Available research has shown that the use of improved maize varieties has improved in other ADDs but not in central Malawi (Smale, 1995), where this study took place. Lilongwe ADD, has three District Agriculture Offices (D.A.O.) namely Lilongwe, Dedza and Ntheu. Lilongwe D.A.O. has 19 Extension Planning Areas (E.P.A.) two of them are Chitsime and Mpingu.

The Chitsime and Mpingu Extension Planning areas are located in the geographical area of Malawi where the researcher is employed and where access was available to information on the rural farmers that participated in the field days on improved maize varieties. This assisted in data collection.

Development of Questionnaire

To evaluate how field days contribute to the adoption of improved maize varieties and to determine the perception of farmer's towards effective field days, the researcher utilized quantitative data collection and analysis. The researcher visited the farmers in their community and this provided an opportunity to meet with farmers face to face which allowed in depth discussion around field days using a researcher developed questionnaire that focused on six major aspects of field days:

- Farmers' knowledge of the recommended improved maize varieties acquired
- Knowledge of improved maize variety by Host - Farmers and Extension Workers
- Logistics of organizing the field day
- Overall effectiveness of the field day
- Farmer networks
- Farmers' decision to plant the improved maize varieties.

Farmers' Knowledge of the Recommended Improved Maize Varieties Acquired

This variable was looking at farmer's ability to mention some characteristics of improved maize varieties. This was adapted from the farmer questionnaire that was looking at adoption behavior of maize growers in Tanzania (Msuya, 2007). The variable

consisted of the following items: farmers mentioning any of the recommended improved maize varieties for the area and farmer's view about replanting hybrid seed.

Knowledge of Improved Maize Variety by Host-Farmers and Extension Workers

A 4-item adapted version from Amudavi et al. (2009), looked at the extension worker preparedness, extension worker's ability to make farmers at ease, extension worker and host farmer adequately explaining the improved maize varieties, host farmer's ability to provide details about the improved maize varieties.

Logistics of Organizing the Field Day

Adapted from Amudavi et al. (2009), four items were used: set up of demonstration plots, adequacy of time allocated for each field day, participation by farmers, interactive learning by farmers.

Overall Effectiveness of the Field Day

The 5 - items adapted from Amudavi et al. (2009) looked at whether the field day enabled farmers to learn new information, how the field day assisted farmer's knowledge about improved maize varieties, if farmer's expectations were achieved and whether they would be interested to attend the field days next time. The sixth item was developed by the researcher; it looked at the farmer's suggestions on the way field days were conducted.

Farmer Networks

This variable looked at other social outlets used by farmers to learn about new varieties, sharing of information gained from field days, farmer's interaction with

extension workers and how helpful other teaching methods were to the field day. The items were developed by the researcher.

Farmers' Decision to Plant the Improved Maize Varieties

This looked at the farmer's readiness to plant any of the improved maize varieties. This was created by the researcher by looking at whether farmers were willing to plant or not.

The questions were reviewed by the expert panel composed of three committee members for appropriateness to the interview's intent. A pilot test was conducted by the researcher with maize small holder farmers that were not participating in the study. The pilot test of the instrument resulted in an Alpha Reliability of .344 and after improving a few questions the Alpha Reliability changed to .611 for the instrument which was within the acceptable range for use of the instrument. A copy of the questionnaire can be found in Appendix A. Institutional Review Board approval for this study was received on 30 May, 2013 from Purdue University under protocol # 1304013552 (Appendix B).

Participants

The participants for this study were small holder farmers who were from the Chitsime and Mpingu Extension Planning Areas where the maize field days took place. The estimated population eligible to attend the field days in both locations was 85 farmers.

Sampling Procedure

It was planned there would be three Field Days during the growing season however because of funding issues only two field days were conducted in each Extension Planning

Area. The Chitsime and Mpingu Extension Planning Areas involved in the study provided field days on improved maize varieties two times during the growing season. The first field day in both E.P.As was held in February, this was during the vegetative (growth) stage. Farmers were able to differentiate the vegetative growth of different maize varieties. The second field day in Mpingu E.P.A was held during the cobbing stage in March. Farmers were able to differentiate size of cobs from different maize varieties. Since the field day took place at the end of the month of March (26th March) when the maize cobs were drying, farmers were able to harvest and test the poundability of different maize varieties. The second field day in Chitsime E.P.A was held during harvest on 10th May, when testing for processing of the maize was conducted. During the field day, farmers were able to compare the cob sizes as well as test the poundability of different maize varieties. In each field day farmers had harvest and had seen the poundability of maize. The random probability sample was used because the sample was drawn from farmers that attended the two field days in the Chitsime and Mpingu Extension Planning Areas.

Maize is a source of livelihood and it is grown by many small holder farmers in Malawi. Interviews were conducted in a specific number of villages with farmers that attended the two field days. The list of names of both male and female farmers who attended the two field days was assigned serial numbers. Using a table of random numbers and simple random sampling the names of farmers to be interviewed were selected. Previous field day data indicate that the number of people that attended the three maize field days were 198 (Male: 90, Female: 108), on average 20 of these attended all three Field Days. The 2013 field days took place on the 15 February and 10 May 2013 for Chitsime

Extension Planning Area, the field days took place on the 14 February and 26 March 2013 for Mpingu Extension Planning Area.

The researcher collected data from 60 small holder farmers, 30 from each Extension Planning Area, this was due to budget constraints. Stutely (2003) suggested that a sample size of 30 or more has mean values close to the larger sample.

Data Analysis

The researcher used SPSS to create data files. The data was analyzed using descriptive statistics which provided a summary of quantitative data collected: frequencies and percentages. Pearson's Spearman Rank Coefficient (rho) and Pearson's Point Biserial Correlation (r_{pb}) were used to quantitatively establish the relationship between gender, marital status, age, level of education, size of household, number of years farming, size of farm (in acres) with the number of acres used to grow maize last season.

CHAPTER FOUR: RESULTS

This chapter presents the findings of the study. Data were analyzed and presented to address the specific objectives of the study.

Socio-economic characteristics of the farmers (N = 60)

Table 1 indicates that of the sixty farmers in the study 29 (48.3%) were male and 31 (51.7%) were female. It should be noted that female farmers had a higher percentage because the study area has a matrilineal family system.

Table 1

Gender of Farmer

Gender	Frequency (f)	Percent (%)
Male	29	48.3
Female	31	51.7
Total	60	100

Forty-six farmers (76.7%) indicated they were married, 25 (41.7%) were male while 21 (35.0%) were female. Three (5.0%) farmers were single and all of them were male. Similarly three (5%) farmers were divorced, 1 (1.7%) was male and 2 (3.3%) were female. Eight (13.3%) farmers were widowed, all of them were female. The marital status by gender is represented in Table 2

Table 2

Marital Status of Farmers

Marital Status	Male		Female	
	f	%	f	%
Married	25	41.7	21	35.0
Single	3	5.0	0	0
Divorced	1	1.7	2	3.3
Widowed	0	0	8	13.3
Total	29	48.3	31	51.7

The farmers' ages ranged from 20 years to more than 49 years. Six farmers (10%) were between 20 – 29 years of age, four (6.7%) were male and two (3.3%) were female. Twenty-two farmers (36.7%) were between the ages of 30 and 39 years and was the largest group among the farmers. Of the twenty-two (36.7%) farmers, 10 (16.7%) were male and 12 (20%) were female. Sixteen farmers (26.7 %) were between 40 – 49 years of age, 7 (11.7%) were male and 9 (15.0%) were female. Similarly sixteen (26.6%) farmers were over 49 years old, 8 (13.3%) were male and 8 (13.3%) were female. The specific age distribution is represented in Table 3.

Table 3

Age of Farmers

Age	Male		Female	
	f	%	f	%
Between 20 and 29 years old	4	6.7	2	3.3
Between 30 and 39 years old	10	16.7	12	20.0
Between 40 and 49 years old	7	11.7	9	15.0
More than 49 years old	8	13.3	8	13.3
Total	29	48.3	31	51.7

Eleven farmers (18.3%) responded that they had no education, 4 (6.7%) were male while 7 (11.7%) were female. Forty-one (68.4%) of the farmers had at least a primary education, 19 (31.7%) male and 22 (36.7%) female. Five (8.3%) farmers, 3 (5.0%) male and 2 (3.3%) female, had a secondary education while three (5%) farmers reported having a post-secondary education, all of them were male. Results of farmers' education by gender are represented in Table 4.

Table 4

Highest Level of Formal Education of Farmers

Education Level	Male		Female	
	f	%	f	%
No Education	4	6.7	7	11.7
Primary	19	31.7	22	36.7
Secondary	3	5.0	2	3.3
Post-Secondary	3	5.0	0	0
Total	29	48.3	31	51.7

The farmers were asked the size of their household. Five (8.3%) farmers, 3 (5.0%) male and 2 (3.3%) female, had households with two people. Four (6.7%) farmers, 3 (5.0%) male and 1 (1.7%) female, had households with three people. Seven (11.7%) farmers, 4 (6.7%) male and 3 (5.0%) female, had households with four people. Twelve (20%) of the farmers, 7 (11.7) male and 5 (8.3) female, had households with five people. Thirty-two (53.3%) of the farmers, 12 (20%) male and 20 (33.3%) female, had households of more than 5 people. The results in Table 5 indicate that a larger number of farmers that had households of more than five people were female.

Table 5

Size of the Farmer's Household

Household Size	Male		Female	
	f	%	f	%
2 people	3	5.0	2	3.3
3 people	3	5.0	1	1.7
4 people	4	6.7	3	5.0
5 people	7	11.7	5	8.3
More than 5 people	12	20.0	20	33.3
Total	29	48.3	31	51.7

Farmers were asked the number of years they have been farming. Results are represented in Table 6. Seven (11.6%) farmers, 5 (8.3%) male and 2 (3.3%) female, reported to have been farming for a period ranging from one to five years. Six (10%) farmers, 2 (3.3%) male and 4 (6.7%) female, have been farming between six to ten years. Similarly six (10%) farmers, 5 (8.3%) male and 1 (1.7%) female, have been farming within the range of eleven to fifteen years. Seventeen (28.3%) farmers, 8 (13.3%) male and 9 (15%) female, have been farming within the range of sixteen to twenty years. Twenty-four (40%) farmers, 9 (15%) male and 15 (25%) female, have been farming for more than 20 years. The results indicate that most (40%) of the farmers have been farming for more than 20 years.

Table 6

Number of Years the Farmer has been Farming

Years	Male		Female	
	f	%	f	%
Between 1 to 5 years	5	8.3	2	3.3
Between 6 to 10 years	2	3.3	4	6.7
Between 11 to 15 years	5	8.3	1	1.7
Between 16 to 20 years	8	13.3	9	15
More than 20 years	9	15.0	15	25
Total	29	48.2	31	51.7

Farmers were asked the size of their farms. Nine (15%) farmers, 6 (10%) male and 3 (5%) female, had less than 1 acre. Fifteen (25%) farmers, 7 (11.7%) male and 8 (13.3%) female, had farms that ranged from 1 to 2 acres. Eighteen (30%) farmers, 4 (6.7%) male and 14 (23.3%) female, had farms that ranged from 2.1 to 3 acres. Eight (13.4%) farmers, 4 (6.7%) male and 4 (6.7%) female, had farms that ranged from 3.1 to 4 acres. Five (8.3%) farmers, 3 (5%) male and 2 (3.3%) female, had farms that ranged from 4.1 to 5 acres. Farmers with farms that were more than 5 acres were five (8.3%), all of them were male. Results for the size of the farm in acres are represented in Table 7.

Table 7

Size of the Farm in Acres

Size of Farm	Male		Female	
	f	%	f	%
Less than 1 acre	6	10	3	5
Between 1 and 2 acres	7	11.7	8	13.3
Between 2.1 and 3 acres	4	6.7	14	23.3
Between 3.1 and 4 acres	4	6.7	4	6.7
Between 4.1 and 5 acres	3	5	2	3.3
More than 5 acres	5	8.3	0	0
Total	29	48.4	31	51.6

Farmers were asked the area of the farm used to grow maize last season. Responses represented in Table 8 indicate that four (6.7%) farmers, 3 (5%) male and 1 (1.7%) female, had grown maize on an area less than .5 acres. Nineteen (31.7%) farmers, 7 (11.7%) male and 12 (20%) female, had grown maize on an area between .5 and 1 acre. Twenty-six (43.3%) farmers, 11 (18.3%) male and 15 (25%) female, used an area that ranged from 1.1 to 2 acres. Six (10%) farmers, 3 (5%) male and 3 (5%) female, had grown maize on an area between 2.1 and 3 acres. Two (3.3%) farmers, all male, had

grown maize on an area between 3.1 and 4 acres. Similarly 3 (5%) farmers, all male, had grown maize on an area of more than 4 acres.

Table 8

Acres Used to Grow Maize Last Season

Acres used to Grow Maize	Male		Female	
	f	%	f	%
Less than .5 acres	3	5	1	1.7
Between .5 and 1 acre	7	11.7	12	20
Between 1.1 and 2 acres	11	18.3	15	25
Between 2.1 and 3 acres	3	5	3	5
Between 3.1 and 4 acres	2	3.3	0	0
More than 4 acres	3	5.0	0	0
Total	29	48.3	31	51.7

Farmers were asked to assess the effectiveness of the field day in improving knowledge of improved maize varieties. This was done by assessing different aspects of the field day. The following sections present the details on each of the five specific objectives set forth in this study.

Objective 1: Determine the level of knowledge of the improved maize varieties acquired by farmers attending field days (N = 60).

In order to achieve this objective, farmers were asked if they had attended the first and the second field day. The third field day was not held so therefore question number 13 of the questionnaire was not used. Fifty-seven (95%) farmers attended the first field day whereas fifty-one (85%) farmers attended the second field day. Forty-eight (80%) farmers attended both field days. Farmers that did not attend either the first field day or the second field day indicated that they were not communicated about the date of the

field day, while some farmers indicated that they were engaged in other household activities.

Farmers were asked to name the recommended maize varieties for their area. Sixty (100%) farmers were able to mention at least one of the recommended maize varieties for the area.

Farmers were also asked the type of improved maize varieties they knew as a result of attending the field days. The varieties mentioned by different farmers were: CAP 9001 hybrid, DKC 8053hybrid, DKC 9053 hybrid, DKC 9089 hybrid, PAN 53 hybrid, PAN 67 hybrid, PAN 4M – 19, PHB 30G-19 hybrid, SC 403, SC 627, SC 719, ZM 623 OPV and ZM 523 OPV.

Farmers were also asked their view about replanting hybrid seed, whether they support it or not. Forty-seven (78.3%) farmers, 23 (38.3%) male and 24 (40%) female, indicated they would not support replanting hybrid seed as represented in Table 9. The following reasons were provided as to why the farmers did not support the view; “The yield decreases because either the seed does not germinate or gets easily attacked by pests and diseases.” Three (5%) farmers, 2 (3.3%) male and 1 (1.7%) female, indicated they would not support and they did not give reasons. Ten (16.7%) farmers, 4 (6.7%) male and 6 (10%) female, supported the idea that hybrid seed can be replanted.

Table 9

Farmer's View on Replanting Hybrid Seed

Farmer's Support of Replanting	Male		Female	
	f	%	f	%
No can provide reasons	23	38.3	24	40.0
No can't provide reasons	2	3.3	1	1.7
Yes	4	6.7	6	10.0

The assessment by the researcher on the farmers' knowledge of recommended maize varieties was determined by the farmer's response to the three aforementioned questions. If the farmer was able to mention any of the improved maize varieties such as: CAP 9001 hybrid, DKC 8053hybrid, DKC 9053 hybrid, DKC 9089 hybrid, MH 26 hybrid, MH 27 hybrid, PAN 53 hybrid, PAN 67 hybrid, PAN 4M – 19, PHB 30G-19 hybrid, SC 403, SC 627, SC 719, ZM 623 OPV, ZM 523 OPV, ZM 721 OPV and ZM 309 as recommended varieties for the area then the farmer was considered to have knowledge of the improved maize varieties. If a farmer mentioned any of the improved maize varieties known as a result of attending a field day, that particular farmer was considered to have knowledge of improved maize varieties. If a farmer did not support the view of replanting hybrid seed, that particular farmer was considered to have knowledge of improved maize varieties. If the farmer responded correctly to all three questions then that farmer was considered to have very good knowledge. If the farmer responded correctly to either one or two questions then that farmer was considered to have some idea. If the farmer did not respond correctly to all three questions then that farmer was considered to have no idea. Results (Table 10) shows that forty-eight (80%)

of the farmers, 25 (41.7%) male and 23 (38.3%) female, had very good knowledge of the recommended varieties. Eight (13.4%) farmers, 4 (6.7%) male and 4 (6.7%) female, seemed to have some idea about improved maize varieties. Four (6.7%) female farmers had no idea about improved maize varieties.

Table 10

Farmer's Knowledge of Recommended Maize Varieties

Farmer's Knowledge	Male		Female	
	f	%	f	%
Has no idea	0	0	4	6.7
Seems to have some idea	4	6.7	4	6.7
Has very good knowledge	25	41.7	23	38.3

Objective 2: Determine the level of knowledge by host farmers and extension workers on the improved maize varieties.

Eight questions were asked related to the aspects of the Host farmer and extension worker's knowledge about the improved maize varieties. Results of the study represented in Table 11 show that thirty-nine (65%) of the farmers, 14 (23.3%) male and 25 (41.7%) female, indicated that the extension workers were well prepared for the field day because signs were up, the host farmers and the extension workers were ready to give a tour and leaflets for the improved maize varieties were available. However thirty-two (53.4%) farmers, 13 (21.7%) male and 19 (31.7%) female, indicated that the extension worker and the host farmer were somewhat prepared for the field day. Farmers wished that the signs posted on the demonstration plots had pictures of what was happening on the demonstration plots, because they could not read what was written as they indicated they

were illiterate. Forty-four (73.3%) of the farmers, 20 (33.3%) male and 24 (40%) female, indicated that extension workers made farmers feel at ease. Thirty-four (56.7%) farmers, 16 (26.7%) male and 18 (30%) female, reported that host farmers showed good knowledge of improved varieties. Further analysis showed that thirty-three (55%) farmers, 15 (25%) male and 18 (30%) female, indicated that host farmers adequately explained improved maize varieties. Forty-seven (78.4%) farmers, 22 (36.7%) male and 25 (41.7%) female, said that extension workers had good understanding of improved varieties. Forty-six (76.7%) of the farmers 21 (35%) male and 25 (41.7%) female, reported that extension workers explained clearly about improved maize varieties. Forty-eight farmers (80%), 22 (36.7%) male and 26 (43.3%) female, indicated that extension workers and host farmers adequately covered materials on improved maize varieties. Fifty-two farmers (86.7%), 27 (45%) male and 25 (41.7%) female, indicated that field day activities were interesting to engage farmers in observational learning.

Table 11

Level of Knowledge on Improved Maize Varieties by Host Farmer and Extension Worker

Frequency (%) Response									
Knowledge by host farmer and extension worker	Male			Female			Total		
	1	2	3	1	2	3	1	2	3
Extension workers were well prepared for the field day	2 (3.3)	13 (21.7)	14 (23.3)	0	6 (10)	25 (41.7)	2 (3.3)	19 (31.7)	39 (65)
Extension workers made farmers feel at ease	0	9 (15.0)	20 (33.3)	0	7 (11.7)	24 (40)	0	16 (26.7)	44 (73.3)
Host farmers showed good knowledge of improved maize varieties	0	13 (21.7)	16 (26.7)	1 (1.7)	12 (20)	18 (30)	1 (1.7)	25 (41.7)	34 (56.7)
Host farmers adequately explained improved maize varieties	1 (1.7)	13 (21.7)	15 (25.0)	1 (1.7)	12 (20)	18 (30)	2 (3.3)	25 (41.7)	33 (55)
Extension workers had good understanding of improved maize varieties	1 (1.7)	6 (10.0)	22 (36.7)	0	6 (10)	25 (41.7)	1 (1.7)	12 (20)	47 (78.3)
Extension workers explained improved maize varieties clearly	2 (3.3)	6 (10.0)	21 (35.0)	0	6 (10)	25 (41.7)	2 (3.3)	12 (20)	46 (76.7)
Extension worker and host farmer adequately covered material on improved maize varieties	0	7 (11.7)	22 (36.7)	1 (1.7)	4 (6.7)	26 (43.3)	1 (1.7)	11 (18.3)	48 (80)
Field day activities interesting to engage farmers in observational learning	0	2 (3.3)	27 (45)	0	6 (10)	25 (41.7)	0	8 (13.3)	52 (86.7)

Note: Likert type scoring: 1 = No, 2 = Somewhat, 3 = Yes

Objective 3: Determine the logistical organization of the field days.

Farmers were asked four questions to assess the logistical organization of the field day, as logistical arrangements play an important role in field day's organization and implementation. Results are represented in Table 12. Fifty (83.3%) farmers, 23 (38.3%) male and 27 (45%) female, were satisfied with the set-up of the demonstration plots. Forty (66.7%) farmers, 21 (35%) male, 19 (31.7%) female, indicated that there was adequate time allocated for each field day. However eight farmers expressed concern that: "A long time was spent waiting for the guest of honor before starting the field day and during the field day session, some demonstration plots were viewed for a short time." Thirty-three (55%) farmers, 17 (28.3%) male and 16 (26.7%) female, indicated that the field day enabled interactive learning. Specifically farmers pointed out that they participated in pounding of maize at the grain mill to examine the poundability of different maize varieties. These results agree with the findings by Osward (2005) that field days provide a forum for interaction between farmers and extension workers. Forty-six (76.7%) farmers, 24 (40%) male and 22 (36.7%) female, indicated that they were satisfied with their level of participation during the field day. However one female farmer indicated that because the organizers had mixed men and women to view the demonstration plots, she felt shy to view the demonstration plot together with male farmers. Similarly one farmer who was between the age group of 20 – 39 years old indicated that as a young farmer he could not freely interact with older farmers.

Table 12

Logistical Organization of the Field Day

Frequency (%) Response									
Logistical Organization of the Field Day	Male			Female			Total		
	1	2	3	1	2	3	1	2	3
Set-up of demonstration plots satisfactory	2 (3.3)	4 (6.7)	23 (38.3)	1 (1.7)	3 (5)	27 (45)	3 (5)	7 (11.7)	50 (83.3)
Adequate time allocated for each field day	3 (5)	5 (8.3)	21 (35.0)	5 (8.3)	7 (11.7)	19 (31.7)	8 (13.3)	12 (20)	40 (66.7)
Field day enabled interactive learning	2 (3.3)	10 (16.7)	17 (28.3)	4 (6.7)	11 (18.3)	16 (26.7)	6 (10)	21 (35)	33 (55)
Level of participation satisfactory	0	5 (8.3)	24 (40.0)	5 (8.3)	4 (6.7)	22 (36.7)	5 (8.3)	9 (15)	46 (76.7)

Note: Likert type scoring: 1 = No, 2 = Somewhat, 3 = Yes definitely

Overall effectiveness of the Field Day

Farmers responded to six items on the overall effectiveness of the field day in improving knowledge. Results are represented in Table 13. Forty-seven (78.3%) farmers, 23 (38.3%) male and 24 (40%) female, said that the field days enabled them to learn new information. Farmers reported that field days assisted them in improving their knowledge about improved maize varieties in a way that they were able to get answers to the questions that they had from extension workers. In particular farmers indicated that the extension workers were able to answer why some maize varieties farmers bought could not germinate. The reasons provided by extension workers were that the maize seed farmers had bought was not the recommended improved variety as labeled on the packet, the agro-dealer had packed un-improved maize variety seeds in the packet; farmers were shown what improved maize variety seed looks like. Farmers were informed by the extension workers where they could buy the improved maize variety seeds. The results agree with the findings by Nyabundi and Kiprono (2011) that field days provide a platform to resolve several agricultural issues. Secondly, farmers reported that they made networks with fellow farmers who had knowledge about improved maize varieties. Thirdly, farmers responded that they were encouraged to see that their fellow farmers were able to plant improved maize varieties. Forty-one (68.3%) farmers, 20 (33.3%) male and 21 (35%) female, indicated that their expectations for attending field days were definitely achieved because their need to know the different improved maize varieties was met. Fifty (98.3%) farmers, 29 (48.3%) male and 30 (50%) female, were interested to attend subsequent field days. Fifty-three (88.3%), 27 (45%) male and 26 (43.3%)

female, rated field days as an appropriate method for disseminating new technologies because it enabled farmers to see the improved maize varieties and were able to interact with extension workers as well as fellow farmers.

Table 13

Overall Effectiveness of the Field Day

	Frequency (%) Response								
Overall Effectiveness	Male			Female			Total		
	1	2	3	1	2	3	1	2	3
Enabled farmer to learn new information	0	6 (10)	23 (38.3)	0	7 (11.7)	24 (40)	0	13 (21.7)	47 (78.3)
Expectations for attending field day were achieved	1 (1.7)	8 (13.3)	20 (33.3)	3 (5)	7 (11.7)	21 (35)	4 (6.7)	15 (25)	41 (68.3)
Farmers interest in attending field day next time	0	0	29 (48.3)	0	1 (1.7)	30 (50)	0	1 (1.7)	59 (98.3)
Field Day rated as an appropriate method for disseminating new technologies	0	2 (3.3)	27 (45)	0	5 (8.3)	26 (43.3)	0	7 (11.7)	53 (88.3)

Note: Likert type scoring: 1 = No, 2 = Somewhat, 3 = Yes definitely

In an open ended question farmers presented the following twelve suggestions on improving the way field days are conducted: “First, field days should be conducted near farmers’ village to reduce the distance to the field day venue. Second, there should be food provided during the field day. Third, farmers should participate in all stages of maize production from seed selection through planting to harvesting. Fourth, extension workers should be making frequent follow-up visits to farmers that have expressed interest to plant the improved maize varieties after the field day. Fifth, demonstration plots should be bigger in size not just 10 meters by 10 meters. Sixth, field days should be conducted at a central place so that a lot of farmers should be able to attend. Seventh, there is need to use a public address system so that all farmers should be able to hear what is explained during the field day. Eighth, farmers should be given start up seed as well as fertilizer in good times after they have expressed interest to plant the improved maize varieties demonstrated. Ninth, viewing of the demonstration plots should be done in different gender groups. Tenth, posters on demonstration plots should be made of iron sheets not flipcharts to avoid getting wet with rain. Eleventh, invited guests should not dominate speaking during the field day because it is the farmers day and twelfth, field day should be starting and finishing on the agreed time so that farmers are able to walk back home while it is not dark.”

Farmer networks

In an open ended question farmers were asked about other social outlets used to learn about improved maize varieties. The following were the responses: “Village meetings; Church groups; Irrigation clubs; Friends; Inter-aid groups; Tobacco clubs;

Village revolving banks; HIV/AIDS clubs; Agroforestry clubs; and Young farmer clubs." However farmers reported that in the social outlets mentioned above, they did not see the performance of the different improved maize varieties as they did during the field days.

Farmers were asked if they have friends who plant improved maize varieties that were displayed during the field day. Results are represented in Table 14. Fifty-nine (98.4%) farmers, 28 (46.7%) male and 31 (51.7%) female, indicated that they have friends who plant improved maize varieties. One (1.7%) male farmer indicated not having friends who plant improved maize varieties.

Table 14

Farmer has Friends who Plant Improved Maize Varieties

Have Friends	Male		Female	
	f	%	f	%
No	1	1.6	0	.0
Yes	28	46.7	31	51.7

Table 15 indicates that fifty-two (86.7%) farmers, 25 (41.7%) male and 27 (45%) female, reported to have shared information that was gained from the field day with another farmer. Seven (11.7%) farmers, 3 (5%) male and 4 (6.7%) female, reported not to have shared information gained.

Table 15

Shared Information from the Field Day with another Farmer

Shared Information	Male		Female	
	f	%	f	%
No	3	5.0	4	6.7
Yes	25	41.7	27	45.0
No response	1	1.7	0	0

In an open ended question farmers were asked the type of information they had shared with fellow farmers after attending the field day. The following were the responses: “Advantages of planting improved maize varieties; The importance of early land preparation for growing maize; How to apply fertilizer in maize crops; Recommended ridge and plant spacing for growing maize. The spacing was said to be 75cm between rows and 25cm between planting stations and planting a single maize seed per station; Recommended improved maize varieties suitable for the area; and the disadvantages of planting local maize in view of insufficient rains.”

The seven (11.7%) farmers that did not share information gained gave the following reasons: “The farmers were busy with other activities; Farmers explained that improved maize varieties that were demonstrated during the field day were learned best by seeing, hence the farmers were unable to explain in the absence of the improved maize varieties; Farmers indicated that some people were not approachable; they could not listen to what the farmers could be explaining.”

Farmers were asked if they regularly interact with extension workers. Table 16 indicates that seven (11.7%) farmers, 3 (5%) male and 4 (6.7%) female, reported that they do not regularly interact with extension workers. The following reasons were provided: “The extension worker stays far from the farmers’ village; The extension worker visits the farmers only when they are preparing for the field days; The farmers were not told the dates the extension workers would visit the farmers in the village therefore the farmers missed the meeting organized by the extension worker; The extension worker just passed by some villages and selected the villages to visit.” Fourteen (23.3%) farmers, 8 (13.3%) male and 6 (10%) female, indicated that they somewhat interact with extension workers. However thirty-nine (65%) farmers, 18 (30%) male and 21 (35%) female, said that they definitely interact with extension workers.

Table 16

Regularly Interact with Extension Workers

Regularly Interact	Male		Female	
	f	%	f	%
No	3	5.0	4	6.7
Somewhat	8	13.3	6	10.0
Yes, definitely	18	30.0	21	35.0

As a follow-up question farmers were asked other methods used to popularize improved maize varieties apart from the field days and extension workers. Results are represented in Table 17. Thirty-eight (63.3%) of the farmers mentioned the radio. However farmers expressed concern that names for different maize varieties could not easily be remembered by just listening to the radio but after attending the field days they

had a practical knowledge of how the improved maize varieties were cared for in the field, how the varieties perform in the field and how the varieties perform during pounding. The results agree with that of Gaikwad, Godase, and Tambe (2011) who reported that farmers adopt a technology after observing the results. The findings also concur with results by Adolwa et al. (2012) that farmers require to see the results of a technology through field days. Ten farmers (16.7%) indicated that posters were used to popularize the improved maize varieties. Five (8.3%) farmers indicated that pictures in the leaflets were used to popularize the improved maize varieties. Two (3.3%) farmers reported that village meetings organized by the group village head were also used to popularize the improved maize varieties. Messages sent from the Department of Agricultural Extension Services to farmers cell phones were reported by two farmers (3.3%). One farmer (1.7%) indicated the use of a mobile van.

Table 17

Other Methods used to Popularize Improved Maize Varieties

Methods	f	%
Radio	38	63.3
Mobile Van	1	1.7
Leaflets	5	8.3
Posters	10	16.7
Village Meetings Organized by Group Village Head	2	3.3
Messages sent to Farmers Cell Phones from the Department of Agricultural Extension Services	2	3.3
No Response	2	3.3
Total	60	100

Farmers were also asked how the extension teaching methods listed in Table 17 were helpful to the field days. Seventeen (28.3%) of the farmers indicated that the pictures on the leaflet helped them to follow the recommended process of planting the improved maize varieties. Two (3.3%) farmers indicated that during the village meeting organized by the Group Village Head, farmers were encouraged to attend the field days in order to learn about the improved varieties. Two (3.3%) farmers were able to get messages on their cellphone encouraging them to plant improved varieties. One (1.7%) farmer reported that the loud speakers on the mobile van enabled many people to hear about the improved maize varieties that were explained on the demonstration plot during the field day. Thirty-eight (63.3%) farmers had no response to the question. As indicated in Table 17, thirty-eight (63.3%) farmers mentioned that the radio was one of the methods used to popularize improved maize varieties. However farmers reported that the radio was not helpful to the field days that were conducted. The following were the explanations provided: “The date and the venue for the field day were not announced on the radio; The explanation about the improved maize varieties that was done by the host farmers during the field day was not recorded and announced on the radio; The radio was mostly used by the agro-dealers to advertise the improved maize variety seeds they were selling.”

Objective 4: Determine farmers’ assessment of their ability to plant improved maize varieties demonstrated during the field days.

On the decision to plant improved maize varieties displayed during the field day farmers were asked if they had ever planted any of the improved maize varieties

displayed during the field day. Results are represented in Table 18. Eleven (18.3%) farmers, 5 (8.3%) male and 6 (10%) female, responded that they have not planted any of the improved varieties displayed during the field day while forty-nine (81.7%) farmers, 24 (40%) male and 25 (41.7%) female, indicated that they had planted at least one of the displayed improved maize varieties.

Table 18

Farmers that have Planted Improved Maize Varieties Displayed During the Field Day

Planted Improved Maize Varieties	Male		Female	
	f	%	f	%
No	5	8.3	6	10.0
Yes	24	40.0	25	41.7

Table 19 indicates that of the forty-nine farmers that have planted the improved maize varieties, seventeen (28.4%) farmers, 7 (11.7%) male and 10 (16.7%) female, started in the last growing season. Ten (16.7%) farmers, 7 (11.7%) male and 3 (5%) female, started two years ago. Twenty-two (36.7%) farmers, 10 (16.7%) male and 12 (20%) female, started more than three years ago.

Table 19

When the Farmer Started Planting the Improved Maize Varieties Mentioned

When Farmer Started Planting Improved Maize Varieties	Male		Female	
	f	%	f	%
Last growing season	7	11.7	10	16.7
Two years ago	7	11.7	3	5.0
More than three years ago	10	16.7	12	20.0
No response	5	8.3	6	10.0

Farmers were asked how they knew about the improved maize varieties that they planted. Table 20 indicates that twenty-two (36.6%) farmers, 11 (18.3%) male and 11 (18.3%) female, knew about the improved maize varieties from the extension workers. Five (8.4%) farmers, 4 (6.7%) male and 1(1.7%) female, got the information about improved maize varieties from the radio. Ten (16.7%) farmers, 3 (5%) male and 7 (11.7%) female, knew about improved maize varieties from fellow farmers, similarly ten (16.6%) farmers, 5 (8.3%) male and 5 (8.3%) female, got the information as a result of attending the field day.

Table 20

How Farmers Knew about Improved Maize Varieties

How Farmers Knew About Improved Maize Varieties	Male		Female	
	f	%	f	%
From fellow farmers	3	5.0	7	11.7
From Extension workers	11	18.3	11	18.3
From radio	4	6.7	1	1.7
From the Field day	5	8.3	5	8.3
No response	5	8.3	6	10.0

On the farmers' readiness to plant any of the improved maize varieties displayed during the field days for the following growing season, sixty (100%) farmers indicated being ready to plant the improved varieties displayed during the field day for the following growing season. The results are not surprising as there were 17 varieties displayed during the field day; this gave farmers a wider choice of selection of the type of improved maize variety that impressed them.

Farmers were asked to name the improved varieties they were going to plant. Results are represented in Table 21. Four (6.7%) farmers, three (5%) male and one (1.7%) female, chose to plant DKC 8053. One (1.7%) female farmer chose to plant DKC 9053. Nine (15%) farmers, three (5%) male and six (10%) female, chose to plant DKC 9089. Thirteen (21.6%) farmers, eight (13.3%) male and 5 (8.3%) female, chose to plant PAN 53. Six (10%) farmers, five (8.3%) male and one (1.7%) female, chose to plant PAN 67. One (1.7%) male farmer chose to plant PHB 30D 79-6. Two (3.4%) farmers, one (1.7%) male and one (1.7%) female, chose to plant SC 403. Ten (16.7%) farmers, seven (11.7%) male and three (5%) female, chose to plant SC 627. Thirty-one (51.6%) farmers, fourteen (23.3%) male and seventeen (28.3%) female, chose to plant SC 719. One (1.7%) male farmer chose to plant ZM 523. One (1.7%) male farmer chose to plant ZM 623 OPV.

Table 21

Maize Varieties the Farmer was Going to Plant

Varieties to be Planted	Gender of Participant			
	Male		Female	
	f	%	f	%
DKC 8053hybrid	3	5.0	1	1.7
DKC 9053 hybrid	0	0	1	1.7
DKC 9089 hybrid	3	5.0	6	10.0
PAN 53 hybrid	8	13.3	5	8.3
PAN 67 hybrid	5	8.3	1	1.7
PHB 30D 79-6	1	1.7	0	0
SC 403	1	1.7	1	1.7
SC 627	7	11.7	3	5.0
SC 719	14	23.3	17	28.3
ZM523	1	1.7	0	0
ZM 623 OPV	1	1.7	0	0

It should be noted that the total number of farmers planting an improved maize variety adds to seventy-nine, which is more than sixty because some farmers chose to plant more than one improved maize variety.

The perceived benefits by the farmers for planning to plant the improved maize varieties are presented in Table 22. Fifty-one (85%) farmers, 25 (42%) male and 26 (43%) female, said that the improved maize varieties were high yielding. Twenty-three (38%) farmers, 11 (18%) male and 12 (20%) female, said that the improved maize varieties were early maturing. Twenty-three (39%) farmers, 13 (22%) male and 10 (17%) female, said that improved maize varieties had good taste. Twelve (20%) farmers, 4 (7%) male and 8t (13%) female, indicated that improved maize varieties were resistant to

drought. Thirty-one (52%) farmers, 16 (27%) male and 15 (25%) female, said that improved maize varieties were resistant to diseases and pests.

Table 22

Perceived Benefits

Benefits of Planting Improved Maize Varieties	Gender of Participant			
	Male		Female	
	f	%	f	%
High yielding	25	42	26	43
Early maturing	11	18	12	20
Good taste	13	22	10	17
Resistant to drought	4	7	8	13
Resistant to diseases and pests	16	27	15	25
Easy to harvest	1	2	4	7

Table 23 presents the top three perceived benefits that were ranked by farmers. Fifty-one (85%) farmers, 25 (42%) male and 26 (43%) female, reported that improved maize varieties were high yielding. Twenty-nine (48%) farmers, 15 (25%) male and 14 (23%) female, said the improved varieties were resistant to diseases and pests. Twenty-one (35%) farmers, 12 (20%) male and 9 (15%) female, reported that improved maize varieties had good taste.

Table 23

Top Benefits

Top Perceived Benefits	Gender of Participant			
	Male		Female	
	f	%	f	%
High yielding	25	42	26	43
Resistant to diseases and pests	15	25	14	23
Good taste	12	20	9	15

The disadvantages for improved maize varieties are reported in Table 24. Sixteen (27%) farmers, 7 (12%) male and 9 (15%) female, indicated that improved maize varieties had less flour. Three (5%) farmers, 2 (3%) male and 1 (2%) female, said that the *nsima* cooked using flour from improved maize varieties does not fill the stomach. Twenty-seven (45%) farmers, 13 (22%) male and 14 (23%) female, indicated that improved maize varieties had low storability. Twenty-four (40%) farmers, 11 (18%) male and 13 (22%) female, said that improved maize varieties rot while in the field. Twenty-one (35%) farmers, 12 (20%) male and 9 (15%) female, reported that improved maize varieties used high implementation costs.

Table 24

Disadvantages of Improved Varieties

Disadvantages	Gender of Participant			
	Male		Female	
	f	%	f	%
Poor hauling quality of the grain	3	5	0	0
Less flour	7	12	9	15
Don't fill the stomach	2	3	1	2
Low storability	13	22	14	23
Need to refresh seed each season	0	0	3	5
Rot while in the field	11	18	13	22
Unavailability of improved seeds	4	7	5	8
Buy expired seed	1	2	3	5
High seed costs	6	10	9	15
High implementation costs	12	20	9	15
Needs a lot of rain	1	2	0	0

Responses to the farmer's top three disadvantages of improved maize varieties are reported in Table 25. Twenty-seven (45%) farmers, 13 (22%) male and 14 (23%) female, reported that improved maize varieties are stored for a short period of time. Twenty-four (40%) farmers, 11 (18%) male and 13 (22%) female, said that improved maize varieties rot while in the field. Twenty-one (35%) farmers, 12 (20%) male and 9 (15%) female, reported that improved maize varieties have high implementation costs.

Table 25

Top Disadvantages

Top Disadvantages	Gender of Participant			
	Male		Female	
	f	%	f	%
Low storability	13	22	14	23
Rot while in the field	11	18	13	22
High implementation costs	12	20	9	15

Since all farmers expressed interest in planting improved maize varieties the question for those that were non-adopters of planting improved maize varieties was not used.

Objective 5: Determine the relationship between gender, marital status, age, level of education, size of household, number of years farming, size of farm (in acres) and the number of acres used to grow maize last season.

Table 26 indicates that among the farmers that grew maize last season three (10.3%) male farmers planted more than 4 acres and two (6.9%) male farmers planted between 3.1 and 4 acres. There were six, 3 (10.3%) male and 3 (9.7%) female, farmers that grew between 2.1 and 3 acres of maize last season. The largest number of farmers (twenty-six), 11 (37.9%) male and 15 (48.4%) female, grew between 1.1 and 2 acres of maize last season. Although more male farmers grew larger acres of maize, it should be noted that more female farmers twenty-seven (87.1%) when compared to eighteen (62.0%) male farmers grew between .5 to 2 acres of maize last season. Open ended

responses indicated that the male farmers reported to have bought land from different villages with an aim of growing more maize and sell the extra maize that was produced.

Table 26

Comparison between Gender and Acres used to Grow Maize Last Season

Gender		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
Male	f	3	7	11	3	2	3	29
	%	10.3	24.1	37.9	10.3	6.9	10.3	100
Female	f	1	12	15	3	0	0	31
	%	3.2	38.7	48.4	9.7	0	0	100

Table 27 shows that of the sixty farmers interviewed, 46 were married, 3 were single, 3 were divorced and 8 were widowed. Among farmers that grew more than 4 acres of maize, all 3 (6.5%) were married. Similarly the 2 (4.3%) farmers that grew between 3.1 and 4 acres were married. The vast majority of the farmers that grew between .5 and 3 acres of maize last season were married.

Table 27

Comparison between Marital Status and Acres used to Grow Maize Last Season

Marital Status		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
Married	f	1	15	20	5	2	3	46
	%	2.2	32.6	43.5	10.9	4.3	6.5	100
Single	f	2	1	0	0	0	0	3
	%	66.7	33.3	0	0	0	0	100
Divorced	f	0	2	0	1	0	0	3
	%	0	66.7	0	33.3	0	0	100
Widowed	f	1	1	6	0	0	0	8
	%	12.5	12.5	75.0	0	0	0	100

Table 28 presents a comparison between the age of the farmers and the number of acres used to grow maize last season. Three farmers, 1 (4.5%) between 30 and 39 years old and 2 (12.5%) between 40 and 49 years old, grew maize on more than 4 acres last season. Two farmers, 1 (4.5%) between 30 and 39 years old and 1 (6.2%) more than 49 years old, grew between 3.1 and 4 acres of maize last season. Six farmers, 1 (4.5%) between 30 and 39 years old, 4 (25%) between 40 and 49 years old, and 1 (6.2%) more than 49 years old, grew between 2.1 and 3 acres of maize last season. Twenty-six farmers, 2 (33.3%) between 20 and 29 years old, 10 (45.5%) between 30 and 39 years old, 5 (31.2%) between 40 and 49 years old, and 9 (56.2%) more than 49 years old, grew between 1.1 and 2 acres of maize last season. Nineteen farmers, 2 (33.3%) between 20 and 29 years old, 8 (36.4%) between 30 and 39 years old, 4 (25%) between 40 and 49 years old, and 5 (31.2%) more than 49 years old, grew between .5 and 1 acre of maize last season. Four farmers, 2 (33.3%) between 20 and 29 years old, 1 (4.5%) between 30 and 39 years old, and 1 (6.2%) between 40 and 49 years old, grew less than .5 acres of maize last season. The findings indicate the older farmers grew more acres of maize last season than the younger farmers.

Table 28

Comparison between Age of Farmers and Acres used to Grow Maize Last Season

Age		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
Between 20 and 29 years old	f	2	2	2	0	0	0	6
	%	33.3	33.3	33.3	0	0	0	100
Between 30 and 39 years old	f	1	8	10	1	1	1	22
	%	4.5	36.4	45.5	4.5	4.5	4.5	100
Between 40 and 49 years old	f	1	4	5	4	0	2	16
	%	6.2	25	31.2	25	0	12.5	100
More than 49 years old	f	0	5	9	1	1	0	16
	%	0	31.2	56.2	6.2	6.2	0	100

Table 29 presents a comparison between the farmer's highest level of education and the number of acres used to grow maize last season. Of the three farmers that grew more than 4 acres of maize last season, 1 (9.1%) had no education, 1 (2.4%) had a primary education, and 1 (20%) had a secondary education. The 2 (4.9%) farmers that grew between 3.1 and 4 acres of maize last season had a primary education. Six farmers, 2 (18.2%) had no education, 3 (7.3%) had a primary education, and 1 (20%) had a secondary education, grew between 2.1 and 3 acres of maize last season. Twenty-six farmers, 3 (27.3%) had no education, 21 (51.2%) had a primary education, 1 (20%) had a secondary education and 1 (33.3%) had post-secondary education, grew between 1.1 and 2 acres of maize last season. Nineteen farmers, 5 (45.5%) had no education, 10 (24.4%) had a primary education, 2 (40%) had a secondary education and 2 (66.7%) had post-secondary education, grew between .5 and 1 acre of maize last season. Four (9.8%) farmers with a primary education grew less than .5 acres of maize last season. The data from this table suggests that farmers that attained primary education and did not proceed to secondary education planted maize on a larger portion of land because they concentrate on growing maize as a source of food and possible income for their families.

Table 29

Comparison between Highest Level of Education and Acres used to Grow Maize Last Season

Highest Level of Education		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
No education	f	0	5	3	2	0	1	11
	%	0	45.5	27.3	18.2	0	9.1	100
Primary	f	4	10	21	3	2	1	41
	%	9.8	24.4	51.2	7.3	4.9	2.4	100
Secondary	f	0	2	1	1	0	1	5
	%	0	40	20	20	0	20	100
Post-Secondary	f	0	2	1	0	0	0	3
	%	0	66.7	33.3	0	0	0	100

Table 30 presents a comparison between size of household and acres used to grow maize last season. Three male farmers grew more than 4 acres of maize last season, 1 (14.3%) had a household of 5 people, and 2 (16.7%) had a household with more than 5 people. Two male farmers grew maize on an area between 3.1 and 4 acres, 1 (33.3%) had a household of 3 people and 1(8.3%) had a household of more than 5 people. Six farmers grew maize on an area between 2.1 and 3 acres, 1 (25%) male farmer had a household of four people, 2 (16.7%) male and 3 (15%) female farmers had households of more than 5 people. Twenty-six farmers grew maize on an area between 1.1 and 2 acres last season, 2 (66.7%) male farmers and 1 (50%) female farmer had a household of 2 people, 1 (100%) female farmer had a household of 3 people, 1 (25%) male farmer and 1 (33.3%) female farmer had a household of 4 people, 3 (42.9%) male farmers and 2 (40%) female farmers had a household of 5 people, and 5 (41.7%) male farmers and 10 (50%) female farmers had a household of more than 5 people. Nineteen farmers grew maize on an area between .5 and 1 acre, 1 (33.3%) male farmer had a household of 3 people, 2 (50%) male farmers and 2 (66.7%) female farmers had a household of 4 people, 2 (28.6%) male farmers and 3 (60%) female farmers had a household of 5 people, and 2 (16.7%) male farmers and 7 (35%) female farmers had a household of more than 5 people. Four farmers grew maize last season on less than .5 acres, 1 (33.3%) male farmer and 1 (50%) female farmer had a household of 2 people, 1 (33.3%) male farmer had a household of 3 people, and 1 (14.3%) male farmer had a household of 5 people. Although there were more female farmers (20) as compared to male farmers (12) who had households of more than 5 people, there was no female farmer that grew maize on an area of more than 3.1 acres. The results indicate that the larger the household the greater the need for food hence the

larger number of acres used to grow maize. The other reason is that the larger the household the higher the availability of human resource to work on the farm.

Table 30

Comparison between Size of Household and Acres used to Grow Maize Last Season

Size of Household		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
2 people	Male	1 (33.3%)	0 (0%)	2 (66.7%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)
	Female	1 (50%)	0 (0%)	1 (50%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)
	Total	2 (40%)	0 (0%)	3 (60%)	0 (0%)	0 (0%)	0 (0%)	5 (100%)
3 people	Male	1 (33.3%)	1 (33.3%)	0 (0%)	0 (0%)	1 (33.3%)	0 (0%)	3 (100%)
	Female	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
	Total	1 (25%)	1 (25.0%)	1 (25%)	0 (0%)	1 (25%)	0 (0%)	4 (100%)
4 people	Male	0 (0%)	2 (50%)	1 (25%)	1 (25%)	0 (0%)	0 (0%)	4 (100%)
	Female	0 (0%)	2 (66.7%)	1 (33.3%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)
	Total	0 (0%)	4 (57.1%)	2 (28.6%)	1 (14.3%)	0 (0%)	0 (0%)	7 (100%)
5 people	Male	1 (14.3%)	2 (28.6%)	3 (42.9%)	0 (0%)	0 (0%)	1 (14.3%)	7 (100%)
	Female	0 (0%)	3 (60%)	2 (40%)	0 (0%)	0 (0%)	0 (0%)	5 (100%)
	Total	1 (8.3%)	5 (41.7%)	5 (41.7%)	0 (0%)	0 (0%)	1 (8.3%)	12 (100%)
More than 5 people	Male	0 (0%)	2 (16.7%)	5 (41.7%)	2 (16.7%)	1 (83%)	2 (16.7%)	12 (100%)
	Female	0 (0%)	7 (35%)	10 (50%)	3 (15%)	0 (0%)	0 (0%)	20 (100%)
	Total	0 (0%)	9 (28.1%)	15 (46.9%)	5 (15.6%)	1 (3.1%)	2 (6.2%)	32 (100%)

Table 31 presents a comparison between number of years farming and acres used to grow maize last season. Three male farmers grew maize on more than 4 acres, 1 (20%) had been farming between 1 to 5 years, 1 (20%) had been farming between 11 to 15 years and 1 (11.1%) had been farming more than 20 years. Two male farmers grew maize on an area between 3.1 and 4 acres, 1 (20%) had been farming between 11 to 15 years, and 1 (12.5%) had been farming between 16 to 20 years. Six farmers grew maize on an area between 2.1 and 3 acres, 1 (12.5%) farmer had been farming between 16 to 20 years, 2 (22.3%) male farmers and 3 (20%) female farmers had been farming for more than 20 years. Twenty-six farmers grew maize on an area between 1.1 and 2 acres, 1 (50%) female farmer had been farming between 1 to 5 years, 1 (50%) male farmer had been farming between 6 to 10 years, 1 (100%) female farmer had been farming between 11 to 15 years, 5 (62.5%) male farmers and 4 (44.4%) female farmers had been farming between 16 to 20 years, 5 (55.6%) male farmers and 9 (60%) female farmers had been farming for more than 20 years. Nineteen farmers grew maize on an area between .5 and 1 acre, 2 (40%) male farmers and 1 (50%) female farmer had been farming between 1 to 5 years, 1 (50%) male farmer and 4 (100%) female farmers had been farming between 6 to 10 years, 3 (60%) male farmers had been farming between 11 to 15 years, 1 (12.5%) male farmer and 4 (44.4%) female farmers had been farming between 16 to 20 years, 3 (20%) female farmers had been farming for more than 20 years. Four farmers grew maize on less than .5 acres, 2 (40%) male farmers had been farming between 1 to 5 years, 1 female farmer had been farming between 16 to 20 years and 1 male farmer had been farming for more than 20 years. The results indicate that farmers with more years of farming experience grew more acres of maize last season.

Table 31

Comparison between Number of Years Farming and Acres used to Grow Maize Last Season

Number of Years Farming		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
Between 1 to 5 years	Male	2 (40%)	2 (40%)	0 (0%)	0 (0%)	0 (0%)	1 (20%)	5 (100%)
	Female	0 (0%)	1 (50%)	1 (50%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)
	Total	2(28.6%)	3 (42.9%)	1 (14.3%)	0 (0%)	0 (0%)	1 (14.3%)	7 (100%)
Between 6 to 10 years	Male	0 (0%)	1 (50%)	1 (50%)	0 (0%)	0 (0%)	0 (0%)	2 (100%)
	Female	0 (0%)	4 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)
	Total	0 (0%)	5 (83.3%)	1 (16.7%)	0 (0%)	0 (0%)	0 (0%)	6 (100%)
Between 11 to 15 years	Male	0 (0%)	3 (60%)	0 (0%)	0 (0%)	1 (20%)	1 (20%)	5 (100%)
	Female	0 (0%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
	Total	0 (0%)	3(50%)	1 (16.7%)	0 (0%)	1 (16.7%)	1 (16.7%)	6 (100%)
Between 16 to 20 years	Male	0 (0%)	1 (12.5%)	5 (62.5%)	1 (12.5%)	1 (12.5%)	0 (0%)	8 (100%)
	Female	1 (11.1%)	4 (44.4%)	4 (44.4%)	0 (0%)	0 (0%)	0 (0%)	9 (100%)
	Total	1 (5.9%)	5 (29.4%)	9 (52.9%)	1 (5.9%)	1 (5.9%)	0 (0%)	17 (100%)
More than 20 years	Male	1 (11.1%)	0 (0%)	5 (55.6%)	2 (22.3%)	0 (0%)	1 (11.1%)	9 (100%)
	Female	0 (0%)	3 (20%)	9 (60%)	3 (20%)	0 (0%)	0 (0%)	15 (100%)
	Total	1 (4.2%)	3 (12.5%)	14 (58.3%)	5 (20.8%)	0 (0%)	1 (4.2%)	24 (100%)

Table 32 presents a comparison between size of farm and acres used to grow maize last season. Three (60%) male farmers that grew maize on more than 4 acres last season had a farm size of more than 5 acres. Two farmers grew between 3.1 and 4 acres of maize last season, 1 (14.3%) male farmer had a farm size between 1 and 2 acres, and 1 (25%) male farmer had a farm size between 3.1 and 4 acres. Six farmers grew between 2.1 and 3 acres of maize last season, 1 (7.1%) female farmer had a farm size between 2.1 and 3 acres, 1 (25%) male farmer and 1 (25%) female farmer had a farm size between 3.1 and 4 acres, 1 (50%) female farmer had a farm size between 4.1 and 5 acres, 2 (40%) male farmers had a farm size of more than 5 acres. Twenty-six farmers grew between 1.1 and 2 acres of maize last season, 1 (16.7%) male farmer had a farm size of less than 1 acre, 3 (42.9%) male farmers and 1 (12.9%) female farmer had a farm size between 1 and 2 acres, 2 (50%) male farmers and 10 (71.4%) female farmers had a farm size between 2.1 and 3 acres, 2 (50%) male farmers and (3 (75%) female farmers had a farm size between 3.1 and 4 acres, 3 (100%) male farmers and 1 (50%) female farmer had a farm size between 4.1 and 5 acres. Nineteen farmers grew between .5 and 1 acre of maize last season, 3 (50%) male farmers and 2 (66.7%) female farmers had a farm size of less than 1 acre, 3 (42.9%) male farmers and 7 (87.5%) female farmers had a farm size between 1 and 2 acres, 1 (25%) male farmer and 3 (21.4%) female farmers had a farm size between 2.1 and 3 acres. Four farmers grew less than .5 acres of maize last season, 2 (33.3%) male farmers and 1 (33.3%) female farmer had a farm size of less than 1 acre, and 1 (25%) male farmer had a farm size between 2.1 and 3 acres. Based upon the numbers it appears that the larger farms (in acres) grew more acres of maize last season.

Table 32

Comparison between Size of Farm and Acres used to Grow Maize Last Season

Size of the Farm (in acres)		Acres Used to Grow Maize Last Season						Total
		Less than .5 acres	Between .5 and 1 acre	Between 1.1 and 2 acres	Between 2.1 and 3 acres	Between 3.1 and 4 acres	More than 4 acres	
Less than 1 acre	Male	2 (33.3%)	3 (50%)	1 (16.7%)	0 (0%)	0 (0%)	0 (0%)	6 (100%)
	Female	1 (33.3%)	2 (66.7%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)
	Total	3 (33.3%)	5 (55.6%)	1 (11.1%)	0 (0%)	0 (0%)	0 (0%)	9 (100%)
Between 1 and 2 acres	Male	0 (0%)	3 (42.9%)	3 (42.9%)	0 (0%)	1 (14.3%)	0 (0%)	7 (100%)
	Female	0 (0%)	7 (87.5%)	1 (12.9%)	0 (0%)	0 (0%)	0 (0%)	8 (100%)
	Total	0 (0%)	10 (66.7%)	4 (26.7%)	0 (0%)	1 (6.7%)	0 (0%)	15 (100%)
Between 2.1 and 3 acres	Male	1 (25%)	1 (25%)	2 (50%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)
	Female	0 (0%)	3 (21.4%)	10 (71.4%)	1 (7.1%)	0 (0%)	0 (0%)	14 (100%)
	Total	1 (5.6%)	4 (22.2%)	12 (66.7%)	1 (5.6%)	0 (0%)	0 (0%)	18 (100%)
Between 3.1 and 4 acres	Male	0 (0%)	0 (0%)	2 (50%)	1 (25%)	1 (25%)	0 (0%)	4 (100%)
	Female	0 (0%)	0 (0%)	3 (75%)	1 (25%)	0 (0%)	0 (0%)	4 (100%)
	Total	0 (0%)	0 (0%)	5 (62.5%)	2 (25%)	1 (12.5%)	0 (0%)	8 (100%)
Between 4.1 and 5 acres	Male	0 (0%)	0 (0%)	3 (100%)	0 (0%)	0 (0%)	0 (0%)	3 (100%)
	Female	0 (0%)	0 (0%)	1 (50%)	1 (50%)	0 (0%)	0 (0%)	2 (100%)
	Total	0 (0%)	0 (0%)	4 (80%)	1 (20%)	0 (0%)	0 (0%)	5 (100%)
More than 5 acres	Male	0 (0%)	0 (0%)	0 (0%)	2 (40%)	0 (0%)	3 (60%)	5 (100%)
	Female	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	Total	0 (0%)	0 (0%)	0 (0%)	2 (40%)	0 (0%)	3 (60%)	5 (100%)

The following variables: age, size of household, number of years farming, and size of farm (in acres) were considered ordinal data and to determine if there was a relationship between these ordinal variables and the number of acres used to grow maize last season, which was also considered an ordinal variable, a Pearson's Spearman Rank Coefficient (rho) was calculated. Table 33 presents the relationship between age, size of household, number of years farming, size of farm (in acres) and the number of acres used to grow maize last season. There is a negligible relationship between age and the number of acres used to grow maize last season (r = .178). However, there is a weak positive relationship between size of household (r = .246) and the number of acres used to grow maize last season. There is also a weak positive relationship between number of years farming (r = .228) and the number of acres used to grow maize last season. The size of farm in acres is positively related to the number of acres used to grow maize last season (r = .716) and is significant at the .01 level which indicates there is a very strong relationship between size of farm (in acres) and the acres used to grow maize last season. The larger the size of farm in acres the more acres were being used to grow maize last season.

Table 33

Relationship between Selected Variables and Acres used to Grow Maize Last Season Using Pearson's Spearman Rank Coefficient

Variables	Spearman Rank Coefficient (rho)
Age	.178
Size of household	.246
Number of years farming	.228
Size of farm in acres	.716**

**p < .01

The following variables: gender, marital status, and level of education were considered nominal data and to determine if there was a relationship between these nominal variables and the number of acres used to grow maize last season, which was an ordinal variable, a Point Biserial Coefficient (r_{pb}) was calculated. Table 34 indicates that there is no relationship between gender and the number of acres used to grow maize last season with a Point Biserial Coefficient of .047, there is a negligible relationship between marital status and the number of acres used to grow maize last season with a Point Biserial Coefficient of .120 and there is a weak positive relationship between level of education and the number of acres used to grow maize last season with a Point Biserial Coefficient of .238.

Table 34

Relationship between Selected Variables and Acres used to Grow Maize Last Season Using Pearson's Point Biserial Coefficient

Selected Variables	Point Biserial Coefficient (r_{pb})
Gender	.047
Marital Status	.120
Level of Education	.238

CHAPTER FIVE: CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter presents conclusions and implications of the results of this study and also provides recommendations for further research.

The purpose of this study was to describe the contribution of field days to promoting the adoption of improved maize varieties by small holder farmers of Chitsime and Mpingu Extension Planning Areas in Lilongwe District, Malawi.

There were five specific objectives in this study. They were to determine:

1. Level of knowledge of improved maize varieties acquired by farmers after attending field days.
2. Level of knowledge by host farmers and extension workers on improved maize varieties.
3. The logistical organization of the field days.
4. Farmers' assessment of their ability to plant improved maize varieties demonstrated during the field days.

5. If there was a relationship between gender, marital status, age, level of education, size of household, number of years farming, size of the farm (acres) and number of acres used to grow maize last season

Conclusions

This study focused on smallholder farmers in Lilongwe District. These conclusions can only be generalized to the population represented by the sample.

The majority of farmers in Lilongwe District were female because the study area has a matrineal family system. Personal interviews were conducted because literacy was a problem among farmers. As shown in the data most of the farmers had at least a primary education, while 18.3% of the farmers had no education. This then requires extension methods that can enable farmers to easily understand the improved agriculture technologies that are being promoted. Over half of the farmers had households of more than five people. The results also indicate that 40% of the farmers have been farming for more than 20 years, which shows that most farmers are experienced. Though most farmers had farms ranging between 2.1 and 3 acres, a larger group of farmers grew maize on an area between 1.1 and 2 acres last season, part of the acreage was used to grow other crops.

The first objective of this study sought to determine the level of knowledge of improved maize varieties acquired by farmers after attending field days. As presented in Chapters 1 and 3 research was to be conducted on the three field days that were planned to be conducted by the Extension Planning Areas (EPAs). However due to budget constraints by the EPAs they only conducted two field days; this led the researcher to

study only two field days. Over half of the farmers had knowledge about the improved maize varieties. The use of other methods such as the radio, mobile van, leaflets, posters, village meetings organized by the group village head and messages sent to farmers' cell phones from the Department of Agricultural Extension Services helped to popularize improved maize varieties. Extension workers should continue using the other methods when conducting field days so as to help popularize improved maize varieties among farmers. Farmers should be provided with adequate time to view the demonstration plots during the field day so that they should see and have a practical feel of what they have been hearing through other extension methods. This will help farmers acquire knowledge and stimulate interest to adopt the improved maize varieties. Rogers (2005) indicated that, "knowledge of an improved technology is the starting point for a decision making process, this begins when an individual is exposed to an improved technology's existence and gains understanding on how it functions" (p. 171).

The second objective explored the knowledge by host farmers and extension workers. Extension workers and host farmers were well prepared for the field day. The demonstration plots had posters up, farmers were given a tour of the demonstration plots and leaflets for the improved maize varieties were distributed to farmers. This is an important finding and should continue happening when conducting field days. However the use of friendly methods such as sign posts should have pictures on what is happening on the demonstration plot so that even the illiterate farmers should be able to capture information that is displayed. According to Masangano and Miles, (2004), in order to increase rates of adoption for improved technologies, there is a need to deliver

information using extension methods that even farmers who cannot read can understand. The host farmers and extension workers showed good knowledge and had explained clearly about improved maize varieties. This is important and should be promoted in conducting field days, because extension workers have to be able to answer questions raised by farmers during the field day. Field day activities should continue to be interesting and provide farmers with hands-on experiences to help them remember what they are seeing and doing.

The third objective explored the logical organization of field days. Set up of demonstration plots was satisfactory. There was adequate time allocated for the field days. However, invited guests for the field day should be advised to arrive at the venue on time so that farmers should not spend time waiting for them and the invited guests should not dominate speaking during the field day. Farmers should be given enough opportunity to ask questions. The field day enabled interactive learning for farmers and the level of participation by farmers was satisfactory. However, there is a need to separate male farmers from female farmers during the viewing of demonstration plots so that the female farmer should not be shy to walk around the field viewing demonstration plots and asking questions. It should be noted that young farmers should be separated from older farmers during viewing of demonstration plots so that young farmers should be free to interact with fellow young farmers. Overall the way the field days were organized enabled farmers to learn new information. As indicated by Isife and Emah (2008), in order to have a significant impact on the demonstrations of recommended agricultural technologies among farmers, adequate logistics and appropriate campaigns should be

used. The questions that farmers had regarding improved maize varieties were answered by extension workers. Immediate responses to questions were provided to farmers. Farmers were also provided with an opportunity to interact with fellow farmers as well as with extension workers. Farmers made networks with other farmers during the field day. This was important because farmers have to continue sharing information after the field day so they continue to learn from each other. The study found that farmers had shared the information gained from the field day; this should be encouraged as it helps disseminate information about improved maize varieties to other farmers that did not attend the field day. Rogers (2005) indicated that "interpersonal networks are very important in the diffusion process" (p 363). Farmers' also indicated that expectations of attending the field days were achieved and they showed interest to attend the subsequent field days. Fifty-three (88.3%) farmers rated the field day as an appropriate method for disseminating improved maize varieties. The field day provides a conducive environment for learning by seeing and doing. Based on the findings of this study it was suggested that: field days should be conducted at a central place near the farmers village; food should be provided to farmers during the field day; farmers should participate in all stages of maize production on the demonstration plot from selection of the planting seed, planting, weeding, and the harvesting of maize. There should be a public address system during the field day so that all farmers are able to hear what is being explained. Sign posts for pictures on what is happening on the demonstration plots should be put on flat iron sheets instead of flipcharts so they do not become wet with the rains. After the field day the iron sheets could be kept in the farmer's house. The farmers' social outlets helped them become aware of the improved maize varieties. However there is a need for maize

demonstration plots to be near places farmers meet so they are able to see the performance of improved maize varieties in the field on a regular basis. The study showed that some farmers did not regularly interact with extension workers. There is a need to strengthen the link between farmers and extension workers through farmer group meetings so farmers can get required information in a timely manner. There is also a need to employ more extension workers so they can stay closer to farmers' villages and have more frequent interaction with farmers.

The fourth objective explored farmer's assessment of their ability to plant improved maize varieties demonstrated during the field day. Overall farmers, who attend the improved maize variety field days, learned the performance of improved maize varieties in the field and after harvest. Subsequently all the farmers were ready to adopt planting improved maize varieties on their farms the following growing season. The first three perceived benefits that led to farmers' willingness to adopt the improved maize varieties were; high yielding, resistant to diseases and pests and good taste. This suggests that extension workers conduct a follow-up with farmers in order to make sure that farmers plant the improved maize varieties and that farmer's questions are timely answered.

Field days can be effective in demonstrating performance of improved maize varieties on the farms. However, there is a need for follow-up by extension workers to farmers that have expressed interest in adopting the improved maize varieties so that farmer's questions and concerns are addressed in a timely manner in the course of implementation.

The fifth and final objective examined relationships between age, size of household, number of years farming, size of the farm (in acres), gender, marital status, level of education and number of acres used to grow maize last season. Data analysis showed that a higher proportion of older farmers grew more acres of maize last season than younger farmers. However, using the Pearson's Spearman Rank Coefficient it was determined there is a negligible relationship (r = .178) between age and the number of acres used to grow maize last season. Although larger households grew maize on larger number of acres, only a weak positive relationship (r = .246) between size of household and the number of acres used to grow maize last season was reported. Farmers with more years of farming grew more acres of maize last season but the data analysis only indicated a weak positive relationship (r = .228) between number of years farming and acres used to grow maize last season. There was a very strong positive relationship (r = .716) between farmers with large farms (in acres) and the acres used to grow maize last season. The larger the farm the more acres used to grow maize last season.

A higher proportion of farmers grew between 1.1 and 2 acres of maize last season. Male farmers were reported to have bought land to grow more maize and sell the extra maize produced. However, results using a Pearson's Point Biserial Coefficient indicated that there is no relationship between gender and the number of acres used to grow maize last season ($r_{pb} = .047$). The largest number of farmers that grew maize on more than 4 acres were married. A Point Biserial Coefficient (r_{pb}) indicated that there was a negligible relationship ($r_{pb} = .120$) between marital status and the number of acres used to grow maize last season. The results of the study also showed that farmers who attained only a

primary education and did not proceed to secondary education planted maize on a larger portion of land. However, a Point Biserial Coefficient (r_{pb}) indicated a weak positive relationship ($r_{pb} = .238$) between level of education and the number of acres used to grow maize last season.

Implications for Practice

The findings from this study can be used to improve the way extension workers plan and conduct field days in Lilongwe District, in Malawi. The use of other methods: radio, mobile van, leaflets, posters, village meetings and messages sent to farmers' cell phones helped farmers to understand improved maize varieties. As extension workers, this information is valuable for us to use as we prepare and help train farmers through conducting more field days. The host farmers and extension workers need to be prompt and both have to be knowledgeable about the content of what is demonstrated during the field day, as this will help them adequately explain what is demonstrated and be able to respond to questions raised by farmers. Logistical arrangements play an important role in field days' implementation. Farmers need to have adequate time to view demonstration plots in the field. As indicated by Adolwa et al. (2012) farmers require to see the performance of a technology through field days conducted on demonstration plots and farmers' fields. The study uncovered that there is a need to have special viewing sessions of the demonstration plots just for the women farmers. Extension workers could possibly separate male farmers from female farmers during the viewing of the demonstration plots, so female farmers would feel free to ask questions. The extension workers could also plan for more women farmers to have demonstration plots so that female farmers

could feel free to view demonstration plots. Posters placed on the demonstration plots should have pictures so that even farmers that are illiterate would be able to follow what is happening on the demonstration plots. Now that it is known how farmers would like field days to be conducted, agriculture extension policy makers in Malawi can use the information from this study to conduct refresher courses for extension workers on how to conduct field days. Lilongwe District extension workers can use information from this study to improve the way field days are planned and conducted. Information from this study can positively impact how field days are conducted in the future. Field days can be effective in promoting adoption of improved maize varieties by small holder farmers through demonstration of the performance of the varieties on the farm and at the mill. However there is need to increase the interaction between extension staff and farmers. It is important for extension workers to conduct frequent follow-up visits to farmers in order to address the questions farmers may have after the field days and as the farmers consider the different maize varieties they wish to plant. Extension workers could also take advantage of meetings organized by the village head to facilitate information sharing among farmers on the progress of activities being implemented and discuss ways of solving challenges met in the implementation process. This would also help extension workers increase their interaction with groups of farmers at a time.

Recommendations for Further Research

This is the first study that looks at the contribution of field days to promoting adoption of improved maize varieties in Lilongwe District, Malawi. The research has provided information, which will inform extension workers on how to better plan and

conduct field days. However further research should be conducted by increasing the sample size to evaluate the contribution of field days to improve adoption of improved maize varieties. Ideally a study would be conducted with farmers from all the 28 Districts in Malawi.

Additional research should be conducted to determine if female farmers feel free to participate in field days conducted by fellow female farmers. The research should look at the possibility of having field days only for women farmers and with a female host farmer in order to find out if female farmers feel free to ask question to female host farmers.

This research survey should be modified and conducted with two groups of farmers, those that attended the field day as well as farmers that did not attend the field day. This will help compare the findings from the two groups.

Another longitudinal study could be conducted to follow farmers that attended the field day through the years to find out if they implement what they had expressed interest in adopting during the field days. The study should also look at the challenges met by the farmers as they implemented the adopted improved technolo

REFERENCES

REFERENCES

Adolwa, I. S., Okoth, P. F., Mulwa, R. M., Esilaba, A. O., Mairura, F. S., & Nambiro, E. (2012). Analysis of Communication and Dissemination Channels Influencing the Adoption of Integrated Soil Fertility Management in Western Kenya. *Journal of Agricultural Education and Extension, 18*(1), 71-86.

Ajayi, M. T. (2001). Evaluation of the effectiveness of field days carried out by agricultural trainees as a technology transfer strategy. *Journal of International Agricultural and Extension Education, 8*(3), 57-64.

Amudavi, D. M., Khan, Z. R., Wanyama, J. M., Midega, C. A. O., Pittchar, J., Hassanali, A., & Pickett, J. A. (2009). Evaluation of farmers' field days as a dissemination tool for push-pull technology in Western Kenya. *Crop Protection, 28*(3), 225-235.

Aphunu, A., & Otoikhian, C. S. O. (2008). Farmers' perception of the effectiveness of extension agents of Delta State Agricultural Development Programme (DADP). *African Journal of General Agriculture, 4*(3), 165-169.

Badu-Apraku, B., Fakorede, M. A. B., Ajala, S. O., Ouedraogo, M., Carsky, R. J., & Menkir, A. (2001). Promoting maize technology transfer in West and Central Africa: a networking approach. *Maize Revolution in West and Central Africa*, 45-65.

Barao, S. M. (1992). Behavioral aspects of technology adoption. *Journal of Extension, 30*(2), 13-15.

Chinsinga, B. (2011). Seeds and subsidies: The Political economy of input programmes in malawi. *IDS Bulletin, 42*(4), 59-68. doi: 10.1111/j.1759-5436.2011.00236.x

Chirwa, E., Kydd, J., & Dorward, A. (2006, 2006). *Future scenarios for agriculture in Malawi: Challenges and dilemmas*.

Chowa, C. (2010). *Harmonization of methods and strategies in delivery system in Malawi.In towards Improving Agriculture Extension in the SADC Region.* Paper presented at the Information sharing among extension players in the SADC Region, Dar es Salaam, Tanzania.

Chowdhury, S., & Ray, P. (2010). Knowledge level and adoption of the integrated pest management (IPM) techniques: a study among the vegetable growers of Katwa sub-division, Bardhaman district. *Indian Journal of Agricultural Research, 44*(3), 168-176.

Coombs, P. H. (1973). *New Paths to Learning for Rural Children and Youth: Nonformal Education for Rural Development*. New York: International Council for Educational Development.

Department of Agricultural Extension Services (1997). *Understanding Extension Systems Approaches and Methodologies*. Lilongwe, Malawi.: Extension Methodologies Branch.

Etling, A. W. (1975). *Characteristics of Facilitators: The Ecuador Project and Beyond*. Massachusetts: Centre for International Education, Hills House South.

Gaikwad, S. P., Godase, S. S., & Tambe, B. N. (2011). Knowledge gained by farmer by participating in field days organized by K.V.K. Pune. *International Journal of Agricultural Sciences, 7*(2), 460-461.

Gibbons, M. J., & Schroeder, R. (1983). *Agricultural Extension*. Washington, D.C.: Peace Corps, Information Collection & Exchange.

GoM. (2000). *Agricultural Extension in the New Millennium: Towards Pluralistic and Demand-driven Services in Malawi: Policy Document*: Government of Malawi, Ministry of Agriculture and Irrigation, Department of Agricultural Extension Services.

GoM. (2011). *Malawi Growth and Development Strategy*. Lilongwe, Malawi: Govt. of Malawi.

Harrer, B. J., Weijo, R. O., & Hattrup, M. P. (1988). The role of change agents in new product adoption: A case study. *Industrial Marketing Management, 17*(2), 95-102.

Hubbard, W. G., & Sandmann, L. R. (2007). Using diffusion of innovation concepts for improved program evaluation. *Journal of Extension, 45*(5) 3-4.

Inaizumi, H. (1999). *Adoption and impact of dry-season dual-purpose cowpea in the semiarid zone of Nigeria*. Nigeria: International Institute of Tropical Agriculture.

Isife, G. N. E. B. I., & Emah, G. N. (2008). Impact of Demonstration of Recommended Farm Practices among Farmers in Obio-Akpor Local Government Area of Rivers State, Nigeria. *Agricultural Journal, 3*(4), 283-285.

Kanchewa, F. (2012). *Improving delivery of agricultural information among Malawian farmers: A case study of Chitsime Extension Planning Area in Lilongwe, Malawi.* (Masters), Purdue.

Khan, J. (1989). Design of a Workshop to Train PSU Faculty as International Consultants in Youth Development.

Khan, Z. R., Amudavi, D. M., Midega, C. A. O., Wanyama, J. M., & Pickett, J. A. (2008). Farmers' perceptions of a 'push-pull' technology for control of cereal stemborers and Striga weed in western Kenya. *Crop protection, 27*(6), 976-987.

King, R. N., & Rollins, T. J. (1995). Factors influencing the adoption of a nitrogen testing program. *Journal of Extension, 33*(4), 2-3.

Krishnamoorthy, T. S., & Radhakrishnan, S. (2012). A study on knowledge and adoption of new sericulture technologies among small mulberry farm size holders of Udumalpet and Krishna giri areas in Tamilnadu. *Indian Journal of Sericulture, 51*(1), 50-58.

Marsh, S. P., Pannell, D. J., & Lindner, R. K. (2000). The impact of agricultural extension on adoption and diffusion of lupins as a new crop in Western Australia. *Animal Production Science, 40*(4), 571-583.

Masangano, C. M., & Miles, C. A. (2004). Factors influencing farmers' adoption of Kalima bean (Phaseolus vulgaris L.) variety in Malawi. *Journal of Sustainable Agriculture, 24*(2), 117-129.

Mloza-Banda, H. R. (2005). *Integrating new trends in farming systems approaches in Malawi*.

Msuya, C. (2007). *The Comparative role of intervening and independent variable in the adoption behaviour of maize growers in Njombe District,Tanzania.* (PhD), Pretoria, South Africa.

Nyabundi, K. W., & Kiprono, P. (2011). Impact of field days on technology dissemination. *Tea, 32*(1), 3-7.

Nyo, A. K. (2009). Crop Demonstration Approach for Technological Diffusion in the Upper West Region of Ghana: How Significant is This Approach to Yield Increase? *Journal of Developments in Sustainable Agriculture, 4*(2), 128-140.

Osward, A. (2005). Striga Control-Tchnologies and their dissemination. *Crop protection, 24*(4), 333-342.

Phiri, M. A. R., Chilonda, P., & Manyamba, C. (2012). Challenges and Opportunities for Raising Agricultural Productivity in Malawi. *International Journal of Agriculture and Forestry, 2*(5), 210-224.

Rogers, E. M. (1995). *Diffusion of innovations*: New York: Free Press.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Roth, J., Brooks-Gunn, J., Murray, L., & Foster, W. (1998). Promoting healthy adolescents: Synthesis of youth development program evaluations. *Journal of Research on Adolescence, 8*(4), 423-459.

Seevers, B., Graham, D., & Conklin, N. (2007). *Education through Cooperative Extension* (2nd ed.). Columbia, OH: Curriculum Materials Service.

Smale, M. (1995). "Maize is life": Malawi's delayed Green Revolution. *World Development, 23*(5), 819-831.

Stutely, R. (2003). The Essentials of Business Numeracy: Bloombery Press.

Yates, B. L. (2001). *Applying Diffusion Theory: Adoption of Media Literacy Programs in Schools*. Paper presented at the Annual Meeting of the International Communication Association Washngton DC.

Zeller, M., Diagne, A., & Mataya, C. (1998). Market access by smallholder farmers in Malawi: Implications for technology adoption, agricultural productivity and crop income. *Agricultural Economics, 19*(1), 219-229.

APPENDICES

Appendix A: Research Questionnaire

TITLE: EFFECTIVENESS OF FIELD DAYS ON PROMOTING THE ADOPTION OF RECOMMENDED IMPROVED MAIZE VARIETIES BY SMALL HOLDER FARMERS IN LILONGWE DISTRICT, MALAWI

INTRODUCTION

My name is Yakosa Tegha. This study is about farmers' perception of the Field Days. I am interested in your opinion on the effectiveness of the Field Days that were conducted and would greatly appreciate your participation in this study. In order for you to participate you must be 18 years old. Do you meet this qualification? ___ Yes ___No.

Your responses to these questions should take approximately 60 minutes to complete. Your responses are confidential and will never be linked to your name. No one will have access to your responses. Your participation in this survey is voluntary and will help me understand how we can better conduct Field Days for the benefit of farmers. If you decide not to participate, this will not affect your standing in the program or in the Field Days. Would you be willing to participate in this study? ____Yes ____No. If Yes, Thank you very much in advance. When would be a good time for me to meet with you to complete the survey which I will read to you?

If No, Thank you very much for your time and consideration.

Date:_____

DEMOGRAPHIC INFORMATION

1. Extension Planning Area:

   (1)___ Chitsime (2)___ Mpingu

2. Name of Village

   (1)___ (2)___ (3)___ (4)___

3. Gender:

   (1)___ Male (2)___ Female

4. Marital status:

   (1)___ Married (2)___ Single (3)___ Divorced (4)___ Widowed

5. How old are you? (In years)

   (1)___ <20 (2)___ 21-29 (3)___ 30-39 (4)___ 40-49 (5)___ >50

6. What is your highest level of formal education?

   (1)___ No education

   (2)___ Primary

   (3)___ Secondary

   (4)___ Post-secondary

7. Household size (number)

   (1)___ < 2 (2)___ 3 (3)___ 4 (4)___ > 5

8. How many years have you been farming?

   (1)___ 1 - 5 years (2)___ 6 – 10 years (3)___ 11 – 15 years (4)___ 16 – 20 years

   (5)___ > 20 years

9. What is the size of your farm (in acres)?

   (1)___ <1 (2)___ 2 (3)___ 3 (4)___ >4

10. What area of your farm (in acres) did you use to grow maize last season?

    (1)___ <.5 (2)___ 1 (3)___ 2 (4)___ >3

ASPECT OF FIELD DAY

Aspect 1: Farmers' Knowledge of the Recommended Improved Maize Varieties Acquired

11. Did you attend the first Maize Field Day (Mpingu: February 14; Chitsime: February 15)?

    (1)___No,

    Explain_____

    (2)___Yes

12. Did you attend the second Maize Field Day (Mpingu: March 26; Chitsime: March 30)?

    (1)___No,

    Explain_____

    (2)___Yes

13. Did you attend the third Maize Field Day (Mpingu: April 23; Chitsime: May 10)?

    (1)___No,

    Explain_____

    (2)___Yes

14. What are the recommended maize varieties for this area?

    (1)___Don't know

    (2)___Replanted hybrid

    (3)___Local varieties

    (4)___Recommended improved varieties MH 26, MH 27, MZ 523, MZ 623, MZ 721, PAN 53, PAN 63, PAN 67, PAN-4M-19, PHB 30D 79-6, PHB 30g-19, SC 62, SC 403, SC 719

    (5)___Others_____

15. What types of maize varieties do you know as a result of attending the Field Days?

    (1)___MH 26 (2)___MH 27 (3)___MZ 523 (4)___MZ 623 (5)___MZ 721
    (6)___PAN 53 (7)___PAN 63 (8)___PAN 67 (9)___PAN-4M-19
    (10)___PHB 30D 79-6 (11)___PHB30G-19 (12)___SC 62
    (13)___SC 403 (14)___SC 719

16. What is your view about replanting hybrid seed? Do you support it or not?

    (1)___No and can provide reasons

    _____

    (2)___No and can't provide reasons

    (3)___Yes

17. Farmer's knowledge of recommended varieties (Assessment by researcher)?

    (1)___Has no idea

    (2)___Seems to have some idea

    (3)___Has very good knowledge

Aspect 2: Knowledge of Improved Maize Varieties by Host Farmer and Extension Worker

18. Was the extension worker prepared for the Field Day? (e.g. signs were up, they were ready to give a tour, availability of leaflets, chairs)

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely

19. Were the Extension workers able to make you at ease (e.g. provided a relaxed environment)?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, we were free to ask questions

20. Did the host farmer show good knowledge of the improved maize varieties?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, the host farmer was able to provide details about the improved maize variety

21. Did the host farmer adequately explain the improved maize varieties?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, the host farmer provided information on different types of maize seed and maturity period, the advantages of growing improved maize varieties

22. Did the Extension worker have a good understanding of the improved maize varieties?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, the extension worker was able to answer the questions asked

23. Was the Extension worker clear in explaining the improved maize varieties

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely

24. Did the host farmer and the extension worker adequately cover the material on the improved maize varieties?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, they explained how to select seed for planting, when to plant, how to care for the crop (weeding, fertilizer application) in the field as well as when to harvest

25. Were the Field Day activities interesting to engage you in observational learning?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely we were able to get into the field and see the differences in the varieties demonstrated

Aspect 3: Logistics of Organizing the Field Day

26. Was the set-up of demonstration plots satisfactory?

    (1)___No

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, the set up was good, the plots were visible from the road and the different varieties were placed side by side, it was easy to compare

27. Was there adequate time allocated for each Field Day?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely

28. Did the Field Day enable you to interactively learn?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, I was able to speak to the host farmer and the extension workers

29. Were you satisfied with your level of participation?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, I was able to participate as much as I wanted

Aspect 4. Overall Effectiveness of the Field Day

30. Did the Field Day enable you to learn new information?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely

31. How did the Field Day assist you to improve your knowledge about improved maize varieties?

    ___I was able to get answers to the questions I had from the subject matter specialist

    ___I was encouraged to see that my fellow farmer was able to plant the improved maize variety

    ___I made networks with fellow farmers who have knowledge about the improved maize varieties

    ___I was informed of where I could buy the maize seed

32. Were your expectations for attending the Field Day achieved?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, my need to know the different improved maize varieties was met

33. Would you be interested in attending the Field Day next time?

    (1)___No, I would not attend

    Why not?

    _____

    (2)___Somewhat

    (3)___Yes, definitely I would attend the next Field Day

34. Would you rate the Field Day as an appropriate method for disseminating new technologies?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely, it enabled me see the improved variety and I was able to interact with extension workers as well as fellow farmers

35. What are your suggestions on improving the way Field Days are conducted?

    (1)__The Field Days should be conducted near my village

    (2)__There should be food provided during the Field Days

    (3)__Other_____

Aspect 5: Farmer Networks

36. What other social outlets do you use to learn about improved maize varieties?

    _____

37. Do you have friends who plant improved maize varieties that were displayed during the Field Day?

    (1)__No

    (2)__Yes

38. Have you ever shared the information gained from the Field Days with another farmer?

    (1)___No

    (2)___Yes

39. If yes, what information did you share?

    _____

40. If no, please explain why you have not shared any information?

    _____

41. Do you regularly interact with extension workers?

    (1)___No,

    Explain_____

    (2)___Somewhat

    (3)___Yes, definitely

42. What other methods were used to popularize the improved maize varieties?

    (1)___Radio

    (2)___Mobile van

    (3)___Leaflets

    (4)___Posters

    (5)___Others

43. How were the other extension teaching methods mentioned above helpful to the Field Days?

    (1)___I heard on the radio about the date for the Field Day

    (2)___I had a better understanding of the improved maize varieties from the puppet show on the mobile van.

    (3)___The pictures on the leaflet helped me follow the recommended process of planting the improved maize varieties.

Aspect 6. Farmers' Decision to Plant the Improved Maize Varieties

44. Have you ever planted any of the improved maize varieties displayed during the Field Day?

    (1)___No (If no, go to question 48)

    (2)___Yes

45. When did you start planting the improved maize varieties mentioned?

    (1)__Last growing season

    (2)__Two years ago

    (3)__More than three years ago

46. How did you know about the improved maize varieties?

    (1)__From fellow farmers

    (2)__From extension workers

    (3)__From the radio

    (4)__From the Field Day

47. Are you ready to plant any of the improved maize varieties that were displayed during the Field Days for this growing season?

    (1)___No

    (2)___Yes

48. If yes, could you name the improved maize varieties you are going to plant?

    (1)___MH 26 (2)___MH 27 (3)___MZ 523 (4)___MZ 623 (5)___MZ 721
    (6)___PAN 53 (7)___PAN 63 (8)___PAN 67 (9)___PAN-4M-19
    (10)___PHB 30D 79-6 (11)___PHB30G-19 (12)___SC 62
    (13)___SC 403 (14)___SC 719

49. What were the perceived benefits of why you were planning to plant improved maize varieties?

    (1)___High yield

    (2)___Early maturity

    (3)___Good taste

    (4)___Resistant to drought

    (5)___Resistant to diseases and pest

    (6)___Easy to harvest

    (7)___Others

    specify_____

50. Rank your top 3 perceived benefits

    (1)_____

    (2)_____

    (3)_____

51. What in your opinion are the disadvantages of improved maize seed varieties?
    (1)___Poor hauling quality of grains
    (2)___Less flour
    (3)___Don't fill the stomach
    (4)___Low storability
    (5)___Need to refresh seeds each season
    (6)___Rot while in the field
    (7)___Unavailability of improved seeds
    (8)___Buy expired seed
    (9)___High seed costs
    (10)___High implementation costs
    (11)___Others
    specify_____
52. Rank your top 3 perceived disadvantages.
    (1)_____
    (2)_____
    (3)_____
53. (For non-adopters) Had you wanted to adopt the recommended variety, is there anything that would have made it impossible or very difficult to do so?
    _____

Thank you very much for your cooperation.

Appendix B: IRB Approval

PURDUE
UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	JERRY PETERS AGAD 220A
From:	JEANNIE DICLEMENTI, Chair Social Science IRB
Date:	05/30/2013
Committee Action:	**Exemption Granted**
IRB Action Date:	05/30/2013
IRB Protocol #:	1304013552
Study Title:	Effectiveness of Field Days on promoting adoption of recommended improved maize varities by smallholder farmers in Lilongwe District, Malawi

The Institutional Review Board (IRB) has reviewed the above-referenced study application and has determined that it meets the criteria for exemption under 45 CFR 46.101(b)(2) .

If you wish to make changes to this study, please refer to our guidance "**Minor Changes Not Requiring Review**" located on our website at http://www.irb.purdue.edu/policies.php. For changes requiring IRB review, please submit an **Amendment to Approved Study** form or **Personnel Amendment to Study** form, whichever is applicable, located on the forms page of our website www.irb.purdue.edu/forms.php. Please contact our office if you have any questions.

Below is a list of best practices that we request you use when conducting your research. The list contains both general items as well as those specific to the different exemption categories.

General

- To recruit from Purdue University classrooms, the instructor and all others associated with conduct of the course (e.g., teaching assistants) must not be present during announcement of the research opportunity or any recruitment activity. This may be accomplished by announcing, in advance, that class will either start later than usual or end earlier than usual so this activity may occur. It should be emphasized that attendance at the announcement and recruitment are voluntary and the student's attendance and enrollment decision will not be shared with those administering the course.
- If students earn extra credit towards their course grade through participation in a research project conducted by someone other than the course instructor(s), such as in the example above, the students participation should only be shared with the course instructor(s) at the end of the semester. Additionally, instructors who allow extra credit to be earned through participation in research must also provide an opportunity for students to earn comparable extra credit through a non-research activity requiring an amount of time and effort comparable to the research option.
- When conducting human subjects research at a non-Purdue college/university, investigators are urged to contact that institution's IRB to determine requirements for conducting research at that institution.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not

submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Category 1

- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Categories 2 and 3

- Surveys and questionnaires should indicate
  - only participants 18 years of age and over are eligible to participate in the research; and
  - that participation is voluntary; and
  - that any questions may be skipped; and
  - include the investigator's name and contact information.
- Investigators should explain to participants the amount of time required to participate. Additionally, they should explain to participants how confidentiality will be maintained or if it will not be maintained.
- When conducting focus group research, investigators cannot guarantee that all participants in the focus group will maintain the confidentiality of other group participants. The investigator should make participants aware of this potential for breach of confidentiality.
- When human subjects research will be conducted in schools or places of business, investigators must obtain written permission from an appropriate authority within the organization. If the written permission was not submitted with the study application at the time of IRB review (e.g., the school would not issue the letter without proof of IRB approval, etc.), the investigator must submit the written permission to the IRB prior to engaging in the research activities (e.g., recruitment, study procedures, etc.). This is an institutional requirement.

Category 6

- Surveys and data collection instruments should note that participation is voluntary.
- Surveys and data collection instruments should note that participants may skip any questions.
- When taste testing foods which are highly allergenic (e.g., peanuts, milk, etc.) investigators should disclose the possibility of a reaction to potential subjects.